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Southern Nevada Mesquite Woodland Habitat Management Plan

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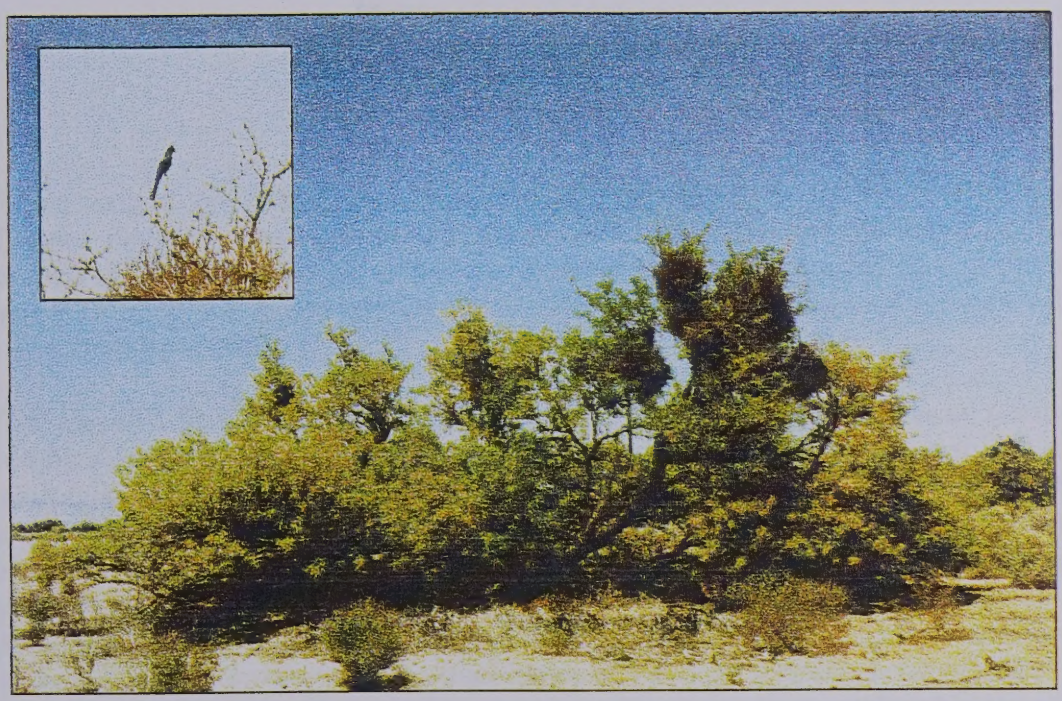

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ABSTRACT

Southern Nevada Mesquite Woodland
Habitat Management Plan

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Denver, CO 80225

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The purpose of this Habitat Management Plan is to provide for specific management of honey mesquite woodlands in southern Nevada that will ensure the long-time survival of woodlands, which will in turn provide important resources needed by the variety of floral and faunal species that depend on mesquite woodlands for survival in a desert environment.

Until recently, little information was available on the condition and status of mesquite woodlands in southern Nevada. The sharp increase in the population growth rate of Las Vegas Valley over the last several years has stimulated the rapid conversion of many mesquite woodlands (or bosques) into baseball fields, golf courses, and suburban developments. This loss of habitat has raised concern for the many native plant and animal species that are closely associated with mesquite woodlands. This Habitat Management Plan summarizes the current condition of southern Nevada's remaining mesquite woodlands, discusses the importance of mesquite woodlands as wildlife habitat, describes past and current threats to woodlands, and sets goals, objectives, and management actions and recommendations for future mesquite woodland conservation on the public lands.

Historically, mesquite bosques in southern Nevada occupied riparian areas along the Muddy and Virgin Rivers and wash systems found throughout Las Vegas, Moapa, and Pahrump Valleys. Most of the mesquite along the major rivers and washes has now been replaced by saltcedar (*Tamarix ramosissima*), an aggressively invasive exotic species. Saltcedar is generally thought to be suboptimal habitat for many desert faunal species that have evolved specific survival and reproductive strategies that are dependent upon certain elements found only within their historic native habitat.

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Southern Nevada's remaining mesquite woodlands are primarily found along drainages and dry lake beds in valley bottomlands where soils are deep and groundwater is relatively high, but perennial surface water is absent. These habitats may not conform to what many consider as the classic riparian system (ie vegetation occupying river- and streamsides); however, they are indeed riparian if we follow the definition of Pinkney (1992):

> "In this definition, hydric soils and perennial flow are not required (DeBano and Schmidt 1989). A terrestrial area, dry arroyo, or stream channel that has a **dependable water supply within the rooting zone** (emphasis added) of riparian vegetation (even with no riparian vegetation present) may be considered a riparian area."

This dependable groundwater supply is a requirement for the continued existence of mesquite woodlands in southern Nevada. However, high water tables also attract human settlements in arid environments. The two communities with the greatest growth rates, Las Vegas and Pahrump, occupy areas that formerly supported some of the largest mesquite bosques found in southern Nevada. These bosques are now either nonexistent, or have been severely degraded due to declining groundwater levels, excessive woodcutting, wildfires, high herbivory pressure, and trampling from livestock and heavy human use.

This Habitat Management Plan will not address the management of remnant patches of mesquite along perennial waters such as the Muddy and Virgin Rivers. These areas will be covered separately under a riparian plan currently under development. This Habitat Management Plan will cover areas outside Las Vegas Valley that support the largest and/or most significant populations of honey mesquite woodlands in Clark and southern Nye Counties. These areas are: Amargosa Flat, Stewart Valley, Pahrump, Stump Spring, and Moapa. Three smaller areas included in the HMP are Sandy Valley, Dry Lake, and Cactus Springs. Objectives have been developed separately for each management area, and depend on specific physical, environmental, and habitat features, amount of use, and ability to support wildlife species, which varies among the eight areas.

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1.0 INTRODUCTION

1.1 Reasons for Preparation and Justification

Honey mesquite (*Prosopis glandulosa*) is a woody shrub or tree of the Fabaceae (Pea) family. The arid climate of the Mojave Desert has confined the distribution of honey mesquite in southern Nevada to areas with perennial or permanent groundwater. The requirement of a permanent, reliable water source has placed mesquite in direct competition for scarce water supplies with a growing human population. Clark County, within which Las Vegas is located, experienced a ca. 40% population increase between 1990 and 1996, and is projected to more than double by 2015 (Sources: U.S. Bureau of the Census, Washington, DC and Nevada State Demographer's Office, Reno, NV). Nye County, which contains the unincorporated town of Pahrump, as well as one of southern Nevada's largest remaining complexes of mesquite woodlands, sustained a ca. 45% population increase for the same time period (Source: U.S. Bureau of the Census, Washington, DC). Increasing population growth has resulted in greater demand for groundwater, and subsequent declines in water table level may threaten the continued survival of honey mesquite in much of its range in southern Nevada. In addition, urban growth has resulted in the destruction of much of Las Vegas Valley's mesquite woodlands, and increased human use of woodlands has resulted in woodland degradation due to uncontrolled woodcutting, trampling, dumping, herbivory, and increased frequency of wildfires.

In a landscape dominated by desert scrub the patchy occurrence of mesquite woodlands serves as important breeding and resting places for many avian species. Woodlands offer protection from weather and predators and provide places where birds have a more favorable energy budget. Desert woodlands comprise a small percentage of the total vegetation in the Southwest, but support greater densities of birds than the surrounding desert habitat (Germano et al. 1983, Laudenslayer 1981, Szaro 1981). Woodlands add structural complexity to the landscape, providing more nesting sites and food resources for breeding birds. Several species of desert breeding birds such as Lucy's Warbler *(Vermivora luciae*) and Phainopepla (*Phainopepla nitens*) are strongly associated with mesquite woodlands (Anderson and Ohmart 1978, Meents et al. 1983). Woodlands also provide important stopover sites for migratory birds. Several studies have discussed the importance of stopover sites for migrants (Kuenzi and Moore 1991, Moore et al. 1990, Rappole and Warner 1976) and have noted that degradation or loss of stopover habitat can severely reduce the chance of a successful migration (Terborgh 1989). Many neotropical migrants cannot store enough fat to support them throughout their entire migration, and must stop periodically to rest and replenish energy reserves (Winker et al. 1992). Patches of mesquite scattered throughout the desert may play an important role in the successful migration of birds attempting to cross large ecological barriers such as deserts (Berthold and Terrill 1991).

Phainopepla is a frugivorous songbird found only in the southwestern United States and Mexico (American Ornithologists' Union 1983). Its name is derived from the Greek words meaning "shining robe", which describes the glossy black plumage of males (Terres 1995). Phainopepla is the only member of the Ptilogonatidae (Silky Flycatcher) family found in the United States. Its range extends from the Mexican Plateau north into Arizona, California, extreme western Texas, and the southern regions of Nevada and New Mexico (Walsberg 1977). Phainopepla's close association with mesquite is linked to its preferred food, the berries of desert mistletoe (*Phoradendron californicum*), which is a parasitic plant that uses a variety of leguminous species as its host. The specialized digestive tract of Phainopepla is an example of its adaptation to a nearly exclusive diet of mistletoe berries (Walsberg 1975).

Because of Phainopepla's close link to its food source, it can be particularly susceptible to changes in the quantity or quality of its habitat. The Bureau of Land Management (BLM) added Phainopepla to its list of Nevada sensitive species[1] in April 1997. Sensitive species are designated by the BLM State Director, in cooperation with state wildlife agencies, and are afforded the same level of protection as is provided for candidate species[2] under BLM Manual 6840.06 D. This policy states that the BLM will "carry out management consistent with the principles of multiple use for the conservation of candidate species and their habitats, and shall ensure that actions authorized, funded, or carried out do not contribute to the need to list any of these species as threatened or endangered".

The Federal Land Policy and Management Act of 1976 (FLPMA) requires that "... the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values; that ... will preserve and protect certain public lands in their natural condition; (and) that will provide food and habitat for fish and wildlife ... ". It is the policy of the BLM "to manage habitat with emphasis on ecosystems to ensure self-sustaining populations and a natural abundance and diversity of wildlife, fish, and plant resources on the public lands" (BLM Manual 6500.06).

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[1] The designation of "sensitive species" includes species that could easily become endangered or extinct in a state.

[2] Candidate species are those species for which the U.S. Fish and Wildlife Service has on file sufficient information on biological vulnerability and threats to support issuance of a proposed rule to list but issuance of the proposed rule is precluded. Identification of candidate species can assist environmental planning efforts by providing advance notice of potential listings and allow land managers to alleviate threats, thereby possibly removing the need to list species as threatened or endangered.

The purpose of this Habitat Management Plan (HMP) is to provide for specific and appropriate management of honey mesquite woodlands in southern Nevada that will ensure the long-term survival of woodlands, which will in turn provide important resources needed by the suite of floral and faunal species associated with mesquite woodlands. If successful, this ecosystem approach to resource management will not only protect and conserve a unique desert plant community, but will help to ensure the continued survival of all associated species.

Conservation measures for mesquite woodlands in Nye County will also protect the Pahrump Valley buckwheat *(Eriogonum bifurcatum*) and Parish's phacelia (*Phacelia parishii*), two BLM sensitive plant species which are closely associated with mesquite. Populations of these annuals in Clark and Nye Counties around the towns of Sandy Valley and Pahrump have been extirpated due to development of private lands.

1.2 Biological Information

1.2.1 Taxonomy

According to Burkart and Simpson (1977), *Prosopis* is an old genus that split into several lineages very early on. Within some of these lineages recent isolation events caused partial speciation, which has produced very similar groups (or sections) of species, as well as similar species within these sections that frequently hybridize. Consequently, the taxonomy of *Prosopis* is complicated and confusing. The taxonomic status used for this HMP is summarized from Burkart and Simpson (1977) and Hickman (1993):

- Family: Fabaceae (Leguminosae) - Pea Family
  Subfamily: Mimosoideae
  Genus: *Prosopis*
  Section: *Algarobia* de Candolle
  Species: *glandulosa*
  Variety: *torreyana*

- Common Name: western honey mesquite

- Habit: Winter deciduous woody shrub or tree generally 1 to 5 m tall, occasionally reaching heights up to 10 m; single or multi-stemmed with spines; dual root system consisting of shallow, widely spreading lateral roots and large tap root.

- Leaves: Bipinnately compound, alternate, oblong, glabrous; primary leaflets generally 1 pair, opposite, 6-17 cm; secondary leaflets 7-17 pairs, opposite, 1-2.5 cm; length 7-9 times the width.

- Flowers: Inflorescence a raceme, 6-10 cm, spike-like; flowers 5-merous, radial, small, yellow, petals generally inconspicuous. Primary mode of pollination is by invertebrate transport, in particular bees.

- Fruit: Indehiscent legume or pod; long, somewhat straight and flattened, somewhat narrowed between seeds; pulpy and green when young, becoming woody and light yellow with maturity.

- Phenology: In southern Nevada, leaf-out begins late April to early May; flowers shortly thereafter; leaf-drop from November to January.

1.2.2 Distribution

Three native species of mesquite occur in the southwestern United States (Fisher 1977): honey mesquite (*P. glandulosa*), velvet mesquite (*P. velutina*), and screwbean mesquite (*P. pubescens*). Honey mesquite occurs in Texas, northern Mexico, and the southern parts of New Mexico, Arizona, Nevada, and California (Simpson and Solbrig 1977) (Fig. 1-1). Velvet mesquite is found in southwestern Arizona and northwestern Mexico (Fig. 1-1), and is distinguished from honey mesquite by its small, velvety leaves. Screwbean is generally found only in locations where surface water is present, such as the edges of springs or streams, and is easily identifiable by the shape of its corkscrew-like pods.

Western populations of honey mesquite (*P. glandulosa* var. *torreyana*) are separated from eastern populations (*P. glandulosa* var. *glandulosa*) by the Pecos River, and can be distinguished by the smaller leaves and longer fruits of the western variety (Hilu et al. 1982). Southern Nevada contains a portion of the northernmost range extent of western honey mesquite. Figure 1-2 shows the distribution of western honey mesquite in southern Nevada.

The root system of mesquite consists of lateral roots used for uptake of nutrients and shallow soil moisture, and large taproots that are able to grow to great depths to reach groundwater. Lateral roots allow mesquite to survive in areas with moderate precipitation where groundwater is less available, while the taproot enables mesquite to exist in arid environments where precipitation and soil moisture are low. In the semi-arid portions of its range such as Texas, New Mexico, and Arizona, precipitation is relatively greater and occurs more frequently than in the arid climates of southern California and Nevada. Mesquite occurring in semi-arid regions can rely on its lateral root system for water uptake, and is thus uncoupled from the requirement of a permanent groundwater source. In contrast, the arid climate of southern Nevada has restricted mesquite to areas with shallow groundwater. Mesquite woodlands in southern Nevada typically occur in areas with deep soils along washes, riparian areas, and the edges of playas (dry lake beds) where their well-developed taproots can easily penetrate into subsurface water.

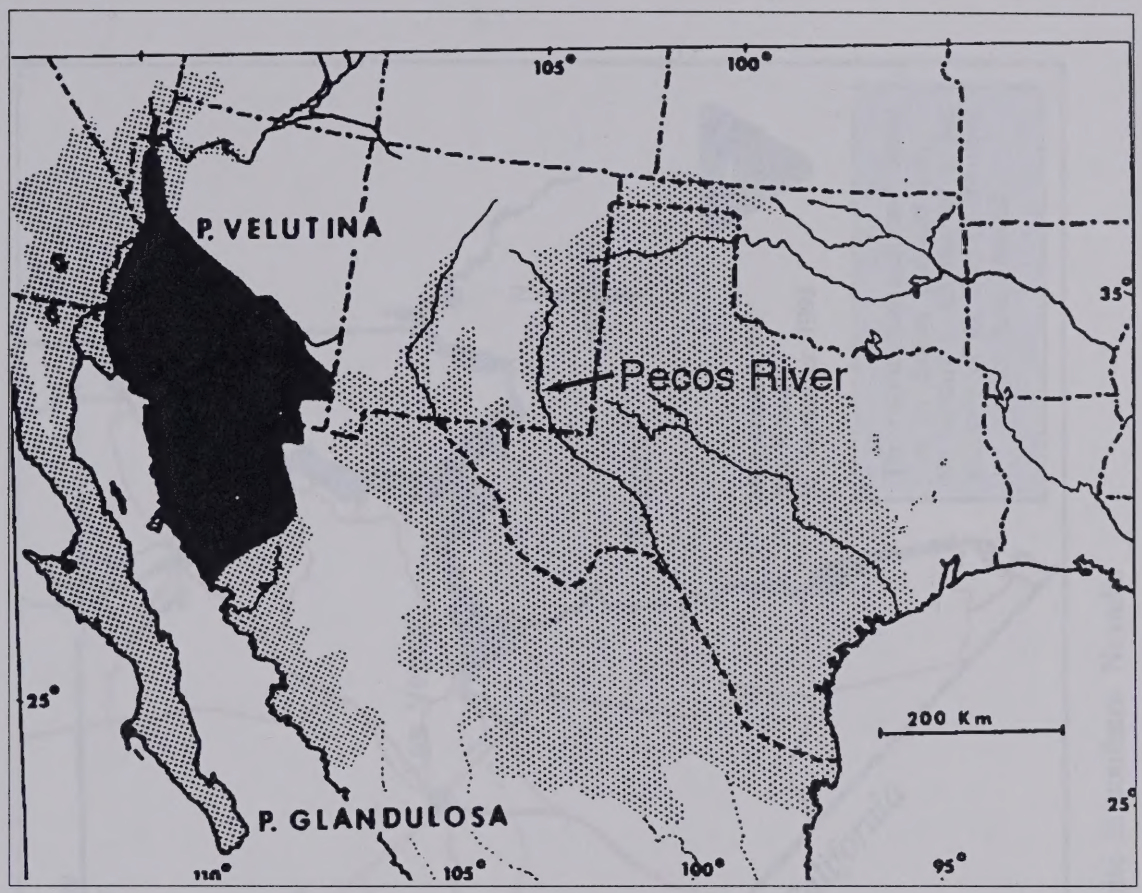


Fig. 1-1. Distribution of honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) in the southwestern United States. Source: B.B. Simpson. 1977. Mesquite: It's Biology in Two Desert Scrub Ecosystems. US/IBP Synthesis Series 4, Dowden, Hutchinson & Ross, Inc., Stroudsburg, PA.

1.2.3 Relevant Research

In the southern Nevada desert, human settlements tend to occupy areas in and around mesquite woodlands because of easy access to groundwater. Consequently, many mesquite "bosques" have now been replaced by residential subdivisions, baseball parks, and golf courses. Much of the woodland habitat in Las Vegas Valley has been lost to urban development, and southern Nevada's remaining woodlands are threatened with continued loss from urban growth (see Fig. 1-3) and increased stress and disturbance from groundwater depletion and higher levels of human use. Pahrump Valley contains southern Nevada's largest remaining complex of mesquite woodlands. Pahrump Valley is an internal drainage basin, and the aquifer, which is recharged by snowmelt from the Spring Mountains to the east, is the source of virtually all the area's water supply. A study on groundwater depletion in Pahrump Valley between

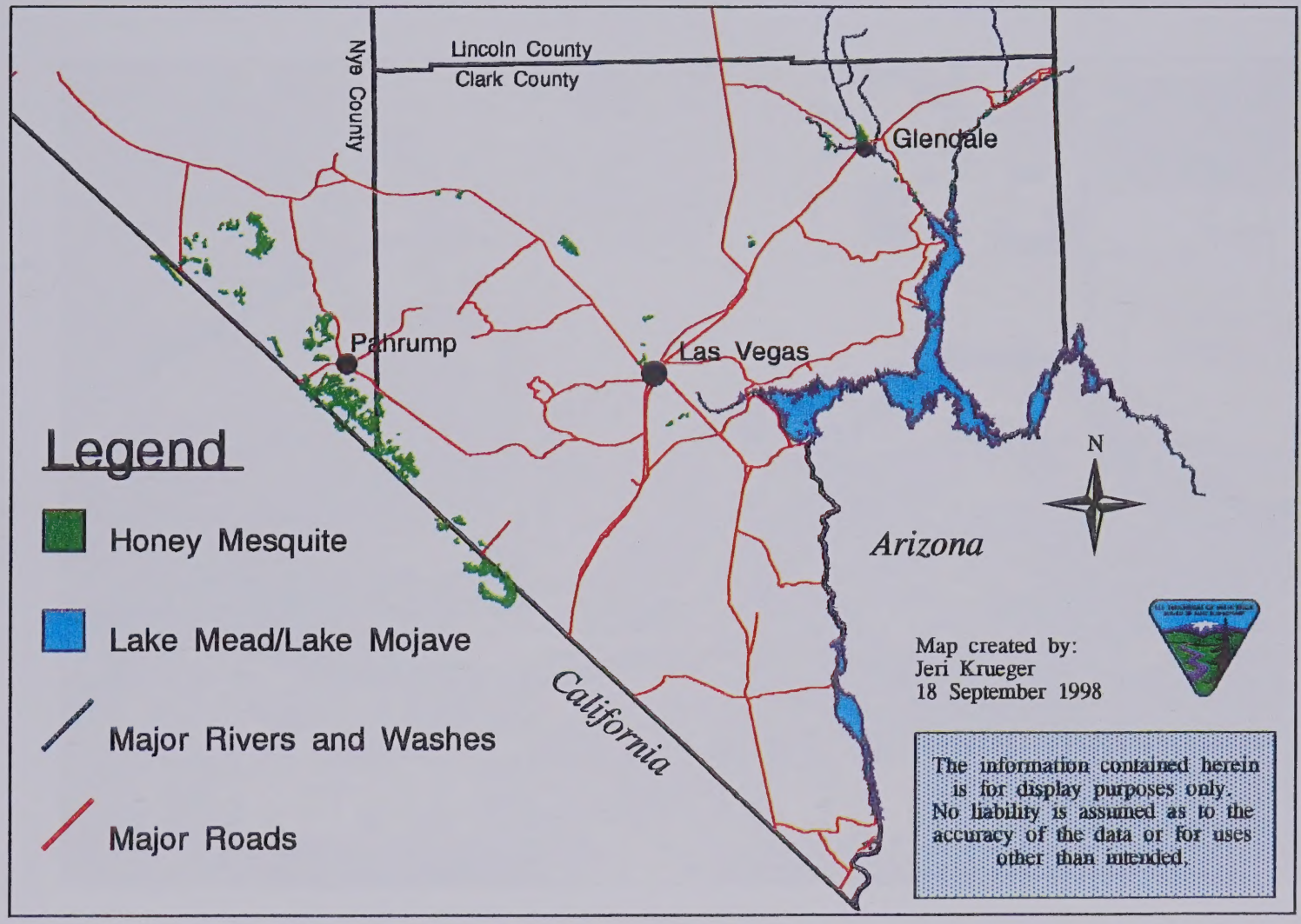


Fig. 1-2. Distribution of western honey mesquite in southern Nevada.

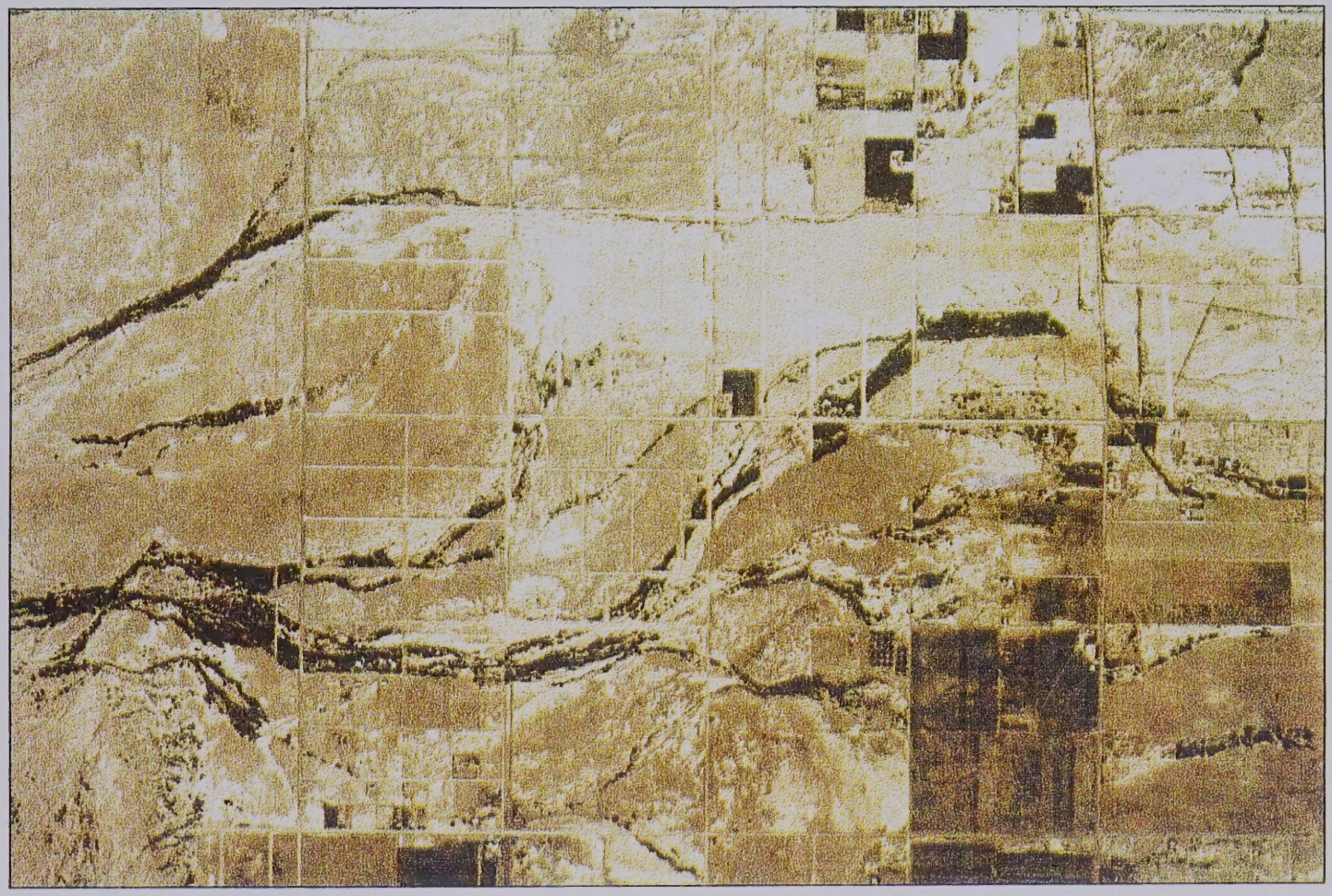


Fig. 1-3. 1980 aerial photo of mesquite woodlands along the western edge of Pahrump, Nye County, Nevada.

the years 1962 and 1975 determined that as of 1975 groundwater pumping was causing an overdraft of 11,000 acre-feet per year (Harrill 1982).

In general, western honey mesquite is shorter in stature with more profuse branching than its eastern relative. However, many studies have shown that mesquite tree size and growth form are also strongly influenced by environmental factors such as groundwater level and physical or mechanical disturbance. Studies by Cannon (1913), Haas and Dodd (1972), Holland (1987), Judd et al. (1971), Minckley and Clark (1984), Nilsen et al. (1984), and Stromberg et al. (1992, 1993) have all described the correlation between tree size and groundwater level, and note that mesquite occurs as a tree in areas where groundwater is relatively close to the soil surface, and decreases in size as distance to the water table increases. Stromberg et al. (1992, 1993) also determined that canopy size decreases and mortality increases with increasing distance to the water table. Although mesquite roots have been excavated at depths as great as 60 m (Phillips 1963), this is the exception rather than the rule. In general, it becomes increasingly difficult for mesquite to survive once the water table falls below 15 m (Judd et al. 1971).

In addition to the effects of groundwater level, damage to the stem as a result of woodcutting, chaining, fire, freezing temperatures, herbivory, and trampling promotes resprouting and transforms tall single-stemmed trees into shorter, multi-stemmed thickets (Fisher 1977, Heitschmidt et al. 1988). In southern Nevada, relatively undisturbed woodlands occurring in areas with a shallow, permanent groundwater source contain single-stemmed trees reaching heights as great as 10 m and stems approaching 1 m in diameter (Krueger 1998). See Figs. 1-4 and 1-5 for examples of differences in size and growth form.

Changes in mesquite woodland structure as a result of stress or disturbance may alter its effectiveness as wildlife habitat. A study on phainopepla habitat use in a mesquite woodland north of Glendale, NV determined that phainopepla preferred nesting in taller trees with fewer stems and heavy mistletoe infestation (Krueger 1998). Taller trees with fewer stems are those that have escaped exposure to stress or damage that causes resprouting, and have survived in their original form long enough to develop heavy mistletoe infestation. Phainopepla's preference for these "oldgrowth" trees is related to its breeding success. Krueger (1998) found that breeding success increased when nests were built higher in the tree within the protection of a mistletoe clump, and declined when nests were built lower in the tree in an exposed location. The occurrence of old, undisturbed trees increases the availability of suitable nesting sites, and therefore increases the chance of a successful nesting attempt.

Desert mistletoe is the parasitic plant that ultimately determines whether or not a mesquite woodland will be occupied by Phainopepla. Some mesquite woodlands in southern Nevada are heavily infested with mistletoe, while others are lightly infested. The extent to which parasitic plants are detrimental to the health and longevity of

Fig. 1-4. Examples of mesquite stem size and number. Above - large single stem nearly 3 feet in diameter. Photo taken at Stewart Valley site northwest of Pahrump, NV. Below - small multi-stemmed growth form. Photo taken at Moapa site north of Glendale, NV. See text under "Existing Environment" for site descriptions.

Fig. 1-5. Examples of mesquite growth form. Above - tall, single-stemmed tree form. Photo taken at Moapa site north of Glendale, NV. Below - short, multi-stemmed shrub form, resulting from wood-cutting. Photo taken at Pahrump site southwest of Pahrump, NV. See text under "Existing Environment" for site descriptions.

infested hosts has been a source of conflicting debate for many years. There is abundant literature on the physiological and ecological interactions between mistletoes and their hosts, but less on the physiological and ecological effects of mistletoes on their hosts.

The degree to which mistletoes cause harm to their hosts is partially dependent upon the parasites' ability to photosynthesize. For instance, members of the genus *Arceuthobium* (dwarf mistletoe) contain very little chlorophyll and therefore do not photosynthesize at a rate great enough to produce enough food for survival. These parasites are known as holoparasites and depend on the host for nearly all of its sugar, water, and nutrient requirements. Dwarf mistletoe can deform or kill trees of any age (Boyce 1961). However, many members of the genus *Phoradendron*, which includes desert mistletoe, are hemiparasites, and contain enough chlorophyll to photosynthesize and produce their own food. Therefore, hemiparasites depend on their hosts for water and nutrients, but do not drain the host plant of sugars. It has been noted that hemiparasites are seldom the primary cause of death to their hosts, but can cause deformations that render them economically useless. The most common damage is death of the portion of the branch beyond the point of infestation (Boyce 1961).

The aerial shoots of mistletoe usually live no more than 10-20 years, but the haustoria (that part of the mistletoe within the host's wood) can live as long as the host. Mistletoes have relatively high light requirements for optimum growth, which may be why more heavily-infested trees are generally found in open areas (Boyce 1961).

It is generally known that mistletoes have higher transpiration rates, as well as lower leaf water potentials and CO_2 assimilation rates, than their hosts. This translates into a lower water use efficiency, meaning that mistletoes transpire more water per unit of CO_2 assimilated than their hosts. In other words, mistletoe has the ability to place a strong demand on the water reserves of its host. However, several studies have recently determined that mistletoes tend to tightly regulate these physiological processes with the concurrent responses of the host (Ullman et al. 1985, Whittington and Sinclair 1988, Davidson et al. 1989). This tight regulation may help avoid undue load on a host under conditions of high transpirational demand (Whittington and Sinclair 1988) and ensure the long-term survival of both host and parasite.

Orozco et al. (1990) determined that mistletoes in a tropical mangrove system had a greater physiological effect on their hosts under more favorable soil water conditions (lower substrate salinities) because the mistletoe is exploiting a less critical habitat. This leads to excessive water consumption by mistletoe that may deplete host water resources. Under conditions of higher substrate salinities, infestation was either low or absent, most likely due to the critically low leaf water potential the mistletoe would need to develop to maintain xylem sap flow from a host under extreme water stress.

In arid and semi-arid climates mistletoes generally exhibit a relatively more conservative water use efficiency and tend to transpire at a rate closer to that of their hosts if nitrogen is more abundantly available (Schulze and Ehleringer 1984). Under these conditions, mistletoes can reduce the amount of water drawn from the host, which can be important for host survival in arid climates. This is most likely why we see a prevalence of mistletoe infestations on nitrogen-fixing plant species in the lower elevations of the Mojave Desert.

Judd et al. (1971) discussed the possible factors contributing to the widespread death of mesquite trees at Casa Grande National Monument in Arizona. Photographs documented heavy mistletoe infestation in trees as far back as 1878. Tree ring analysis of three mesquite tree cross-sections determined tree ages of 110, 111, and 137 years. All trees in the area died between 1931 and 1949. Death was attributed to the precipitous decline of the water table (from 42'6" in 1931 to 102' in 1949) and aggravated by heavy mistletoe infestation, with tree age and insect infestation listed as secondary factors.

1.3 Existing Environment

Western honey mesquite exhibits a widely spaced and patchy distribution throughout southern Nevada. There are five general locations outside of Las Vegas Valley that support the largest and/or most significant populations of honey mesquite. These five areas are: 1) Moapa, 2) Amargosa Flat, 3) Stewart Valley, 4) Pahrump, and 5) Stump Spring. There are also several areas that contain relatively small patches of mesquite. They are: Sandy Valley, Dry Lake, and Cactus and Indian Springs. All sites are located in areas where no perennial surface water is available. Remnant patches of mesquite are also found scattered along Meadow Valley Wash and the Virgin and Muddy Rivers; however, this plan will not address riparian mesquite as these areas will be covered under a separate riparian plan. Figure 1-6 shows the general location of the Mesquite Woodland Habitat Management Areas (HMAs) that will be addressed in this plan.

1.3.1 Location, Acreage, and General Description

The distribution of mesquite woodlands in Nevada extends through Clark and southern Nye Counties. Clark and southern Nye Counties cover approximately 7.3 million acres, of which less than 20,000 acres (ca. 0.15%) is occupied by mesquite woodlands. Following is a general description of each Habitat Management Area, including location and acreage. A summary of the acreages for all HMAs, as well as a breakdown of acreage for mesquite on private and public land, is found in Table 1-1. Separate location maps for each site are found in Appendix I.

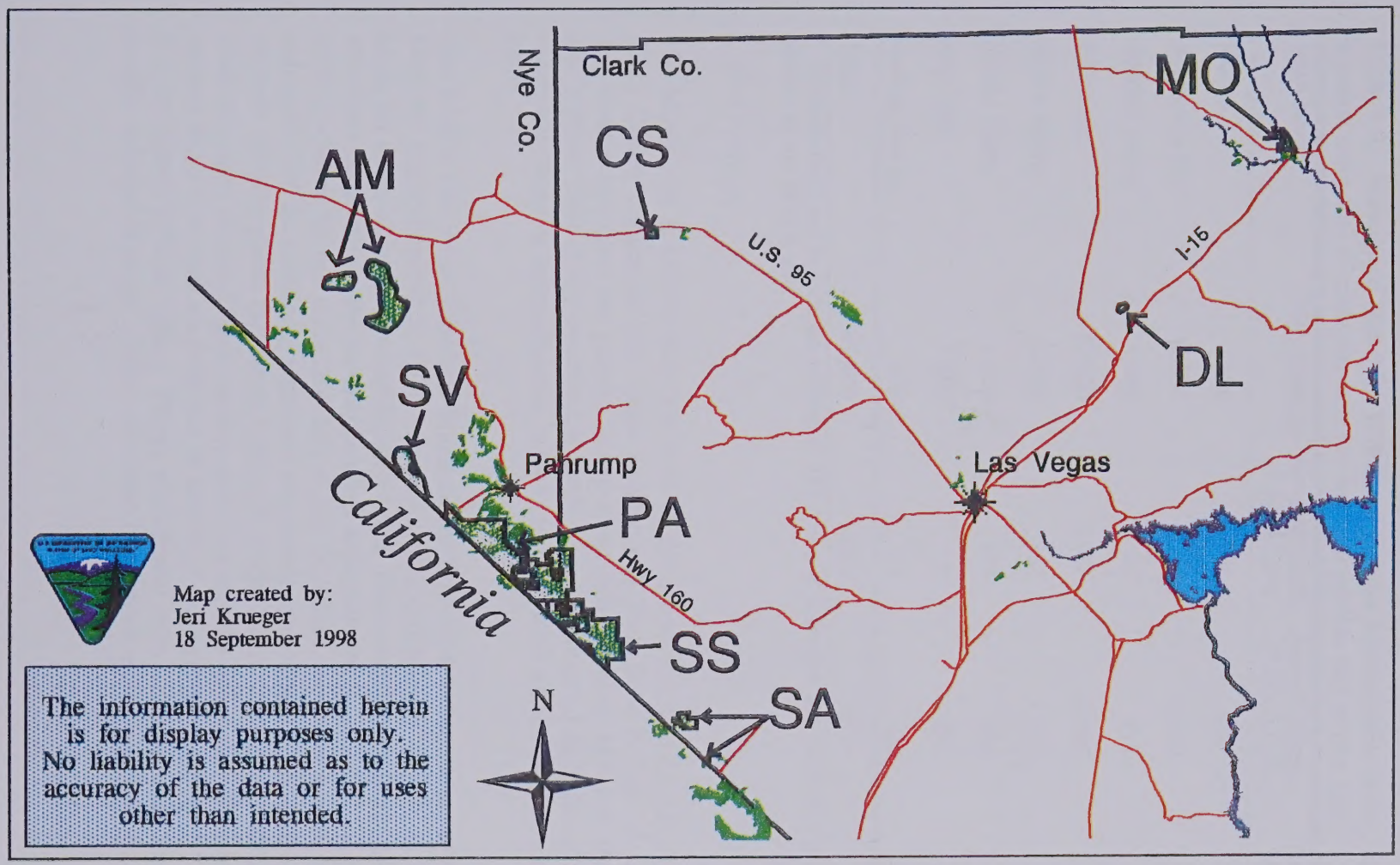


Fig. 1-6. Location of Mesquite Woodland Habitat Management Areas in southern Nevada. MO = Moapa; AM = Amargosa Flat; SV = Stewart Valley; PA = Pahrump; SS = Stump Spring; SA = Sandy Valley; DL = Dry Lake; CS = Cactus Springs.

Table 1-1. Acreage of Mesquite Woodland Habitat Management Areas, including separate estimates of mesquite acreage for both private and public land.

HMA Name	HMA Acreage	Acres Mesquite Private Land	Acres Mesquite Public Lands	Total Acres Mesquite
Moapa	1,120	106	122[a]	228
Amargosa Flat	12,090	0	1,930	1,930
Stewart Valley	4,940	55	215	270
Pahrump	26,000	3,357	3,385	6,742
Stump Spring	14,835	332	1,584	1,916
Sandy Valley	1,625	113	192	305
Dry Lake	355	0	270	270
Cactus Springs	505	21	63	84
Total	61,470	3,984	7,761	11,745

[a] Acreage does not include an additional 234 acres of mesquite that burned in a June 1995 wildfire at the Moapa site.

1.3.1.1 Moapa

The Moapa site is located three km north of the community of Glendale, Nevada in Clark County (Appendix IA). Legal location is T 14 S, R 66 E, Sec. 23, 26, 35, 36. The Moapa woodland lies parallel to and about 300 m east of Meadow Valley Wash. The western edge of the woodland is flanked by two irrigated agricultural fields. The woodland occupies approximately 187 ha (460 ac), most of which occurs on public lands.

The BLM's Las Vegas Resource Management Plan (RMP) dated May 1998 (Record of Decision signed October 5, 1998) has identified approximately 40,950 acres of public lands for disposal in the Moapa/Glendale area. Approximately 35 acres of mesquite woodland occur within the Moapa/Glendale land disposal area (Fig. 1-7). In June 1995 a wildfire burned more than half of the woodland, leaving about 49 ha (120 ac) unburned. Of the remaining unburned woodland, approximately one-half is comprised of short shrubby plants that are in a state of severe stress. The other half supports a relatively open grove of large, mature trees that are 90+ years old. Tree recruitment appears to be low, with no evidence of seedlings and very few saplings. Approximately 45% of trees at Moapa are infested with mistletoe, with less than 10% heavily infested (Krueger 1998). Mistletoe berry production is very high at this site.

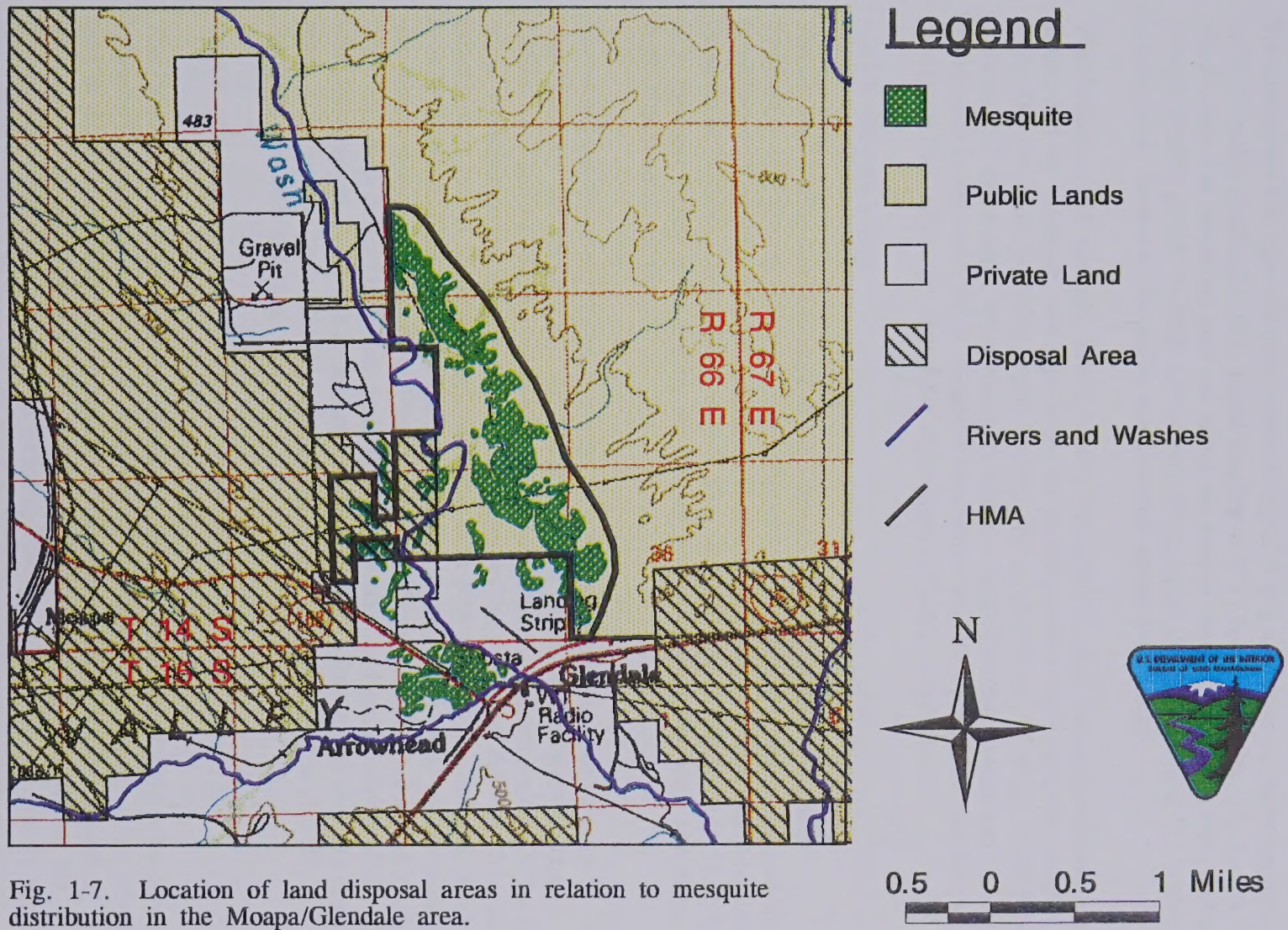


Fig. 1-7. Location of land disposal areas in relation to mesquite distribution in the Moapa/Glendale area.

1.3.1.2 Amargosa Flat

The Amargosa Flat site is located about 21 km (13 mi) northwest of Pahrump, Nevada in Nye County (Appendix IB). Legal location is T 17 S, R 51 E, Sec. 11, 12, 13, 14, 22, 23, 24. The woodland fans out along the eastern edge of Amargosa Flat, which is a large alkaline playa. A large active clay pit occupies the playa, which lies within private land. However, the entire woodland occurs on public land.

The Amargosa Flat mesquite site is mostly composed of large mesquite-covered sand dunes, and the mesquite, although large, are shrubby with a multi-stemmed growth form. The woodland occupies approximately 781 ha (1,930 ac), of which about 90% is composed of these large, dense mesquite dunes. Age class distribution and recruitment is unknown. Both mistletoe infestation and berry production are low at Amargosa Flat, and only a few trees show signs of heavy infestation.

1.3.1.3 Stewart Valley

The Stewart Valley site is located about 7 km (3.5 miles) straight west of the community of Pahrump in Nye County (Appendix IC). The site can be reached by travelling 1.25 miles west of Pahrump on Highway 372, then north on Ash Meadows Road for 4.75 miles. Legal location is T 19 S, R 52 E, Sec. 31; T 20 S, R 52 E, Sec. 6, 7. Stewart Valley is flanked by the Resting Spring Range to the west and High Peak Mountain to the east.

The woodland lies along the eastern edge of a dry lake bed, and encompasses approximately 109 ha (269 ac). Of this acreage, ca. 70 ha are occupied by large, mature trees and ca. 40 ha contain shrubby dune mesquite. Approximately 22 ha (55 ac) of woodland occur on private land that occupies the middle of the site. Mistletoe infestation is low at Stewart Valley, with less than 40% of trees infested and about 7% heavily infested. This site, although small in size, is one of the most pristine mesquite woodlands remaining in southern Nevada. Trees at Stewart Valley are significantly larger and have fewer stems than trees at the other sites, and reach heights of 25-30 ft with stems approaching 3 ft in diameter (Krueger 1998). Tree age at this site can reach 110+ years. Recruitment is good, with an age class distribution of 25% seedlings and 10% saplings.

1.3.1.4 Pahrump

The Pahrump site occupies an area along the southwestern edge of the community of Pahrump (Appendix ID). Most of the mesquite is within Nye County, with a small area in the extreme southeastern portions of the site occurring in Clark County. Mesquite in this area forms a large complex of linear woodlands that follow the general east-west drainage pattern in Pahrump Valley. Woodlands are widely scattered throughout Pahrump Valley, but the most significant portions that occur on public

lands are found in townships T 21 S, R 53 E and T 21 S, R 54 E. Approximately 2,729 ha (6,742 ac) of mesquite woodlands are found in the vicinity of Pahrump, with about one-half occurring on private land. Most of the mesquite in the Pahrump area are large trees, becoming smaller and shrubbier in the more southeastern parts of its distribution in Pahrump Valley. Recruitment is good, with an age class distribution of 5% seedlings and >30% saplings. Some portions of the woodland complex show signs of heavy mistletoe infestation while others show little or no infestation.

The RMP has identified approximately 14,768 acres of public lands for disposal in the Pahrump area. Approximately 706 acres of mesquite woodlands occur within the Pahrump land disposal area (Fig. 1-8). The Pahrump woodlands have been subjected to heavy human use due to its location adjacent to a growing urban area. An extensive network of dirt roads criss-crosses the area, which has led to easy access to nearly all areas of the woodlands. Impacts associated with human disturbance including woodcutting and wildfires have altered or destroyed large portions of the woodlands. Extensive woodcutting activity has transformed much of the woodland from large trees into short, multi-stemmed shrubs (see Fig. 1-5). The number and intensity of wildfires have dramatically increased over the last several years, destroying 235 acres of mesquite in the Moapa/Glendale area in 1995 and at least 50 acres of mesquite in the Pahrump area in 1997 and 1998 (Fig. 1-9). Illegal dumping is also a severe problem at this location, with some sites containing toxic or dangerous substances such as discarded car batteries, antifreeze, gasoline, and oil. The most heavily impacted areas on public lands are those that lie close to private land boundaries. Declining groundwater levels may also become a critical factor in the future survival of mesquite woodlands in Pahrump Valley because the relatively shallow aquifer is Pahrump's sole source of water.

1.3.1.5 Stump Spring

The Stump Spring site is located approximately 16 km (9.5 mi) southeast of Pahrump in Clark County (Appendix IE). The site can be reached by travelling 9 miles southeast on Highway 160 from the Nye/Clark County border, then 6 miles southwest on the Old Spanish Trail Highway (Road to Tecopa). Legal location of the site is T 22 S, R 54 E, Sec. 13 - 15, 21 - 27, 35, 36; T 23 S, R 54 E, Sec. 1; T 22 S, R 55 E, Sec. 19, 28 - 33; T 23 S, R 55 E, Sec. 3 - 10, 17. This area supports approximately 775 ha (1915 ac) of mesquite, of which 135 ha (330 ac) occur on private land. The woodlands are actually a continuation of the Pahrump Valley woodland complex, but has been treated as a separate area because of its unique history and differences in topography, soils, and general mesquite tree growth form.

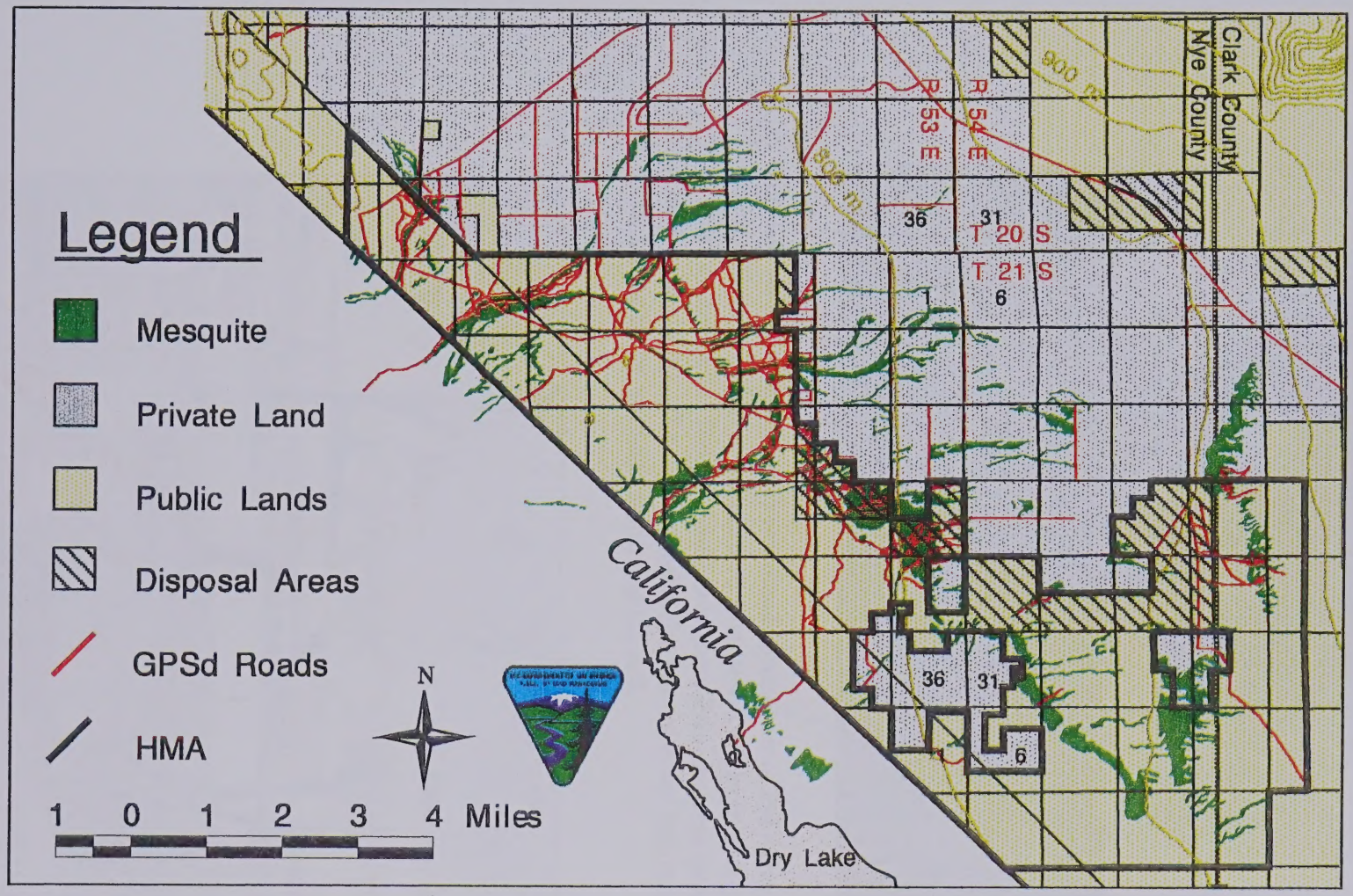


Fig. 1-8. Location of land disposal areas in relation to mesquite distribution in the Pahrump Valley area.

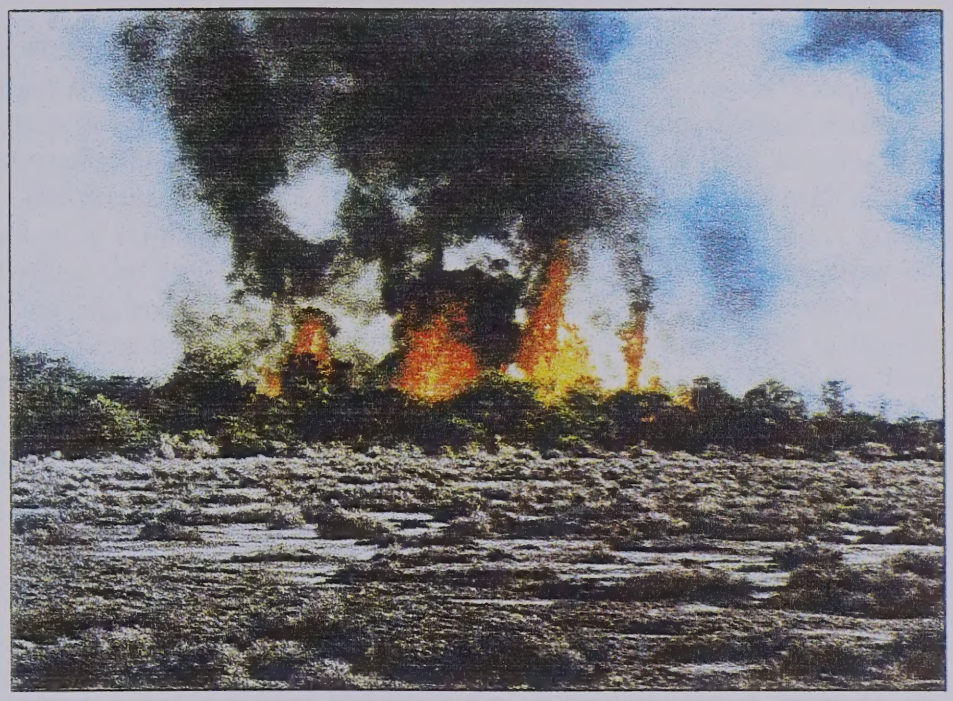
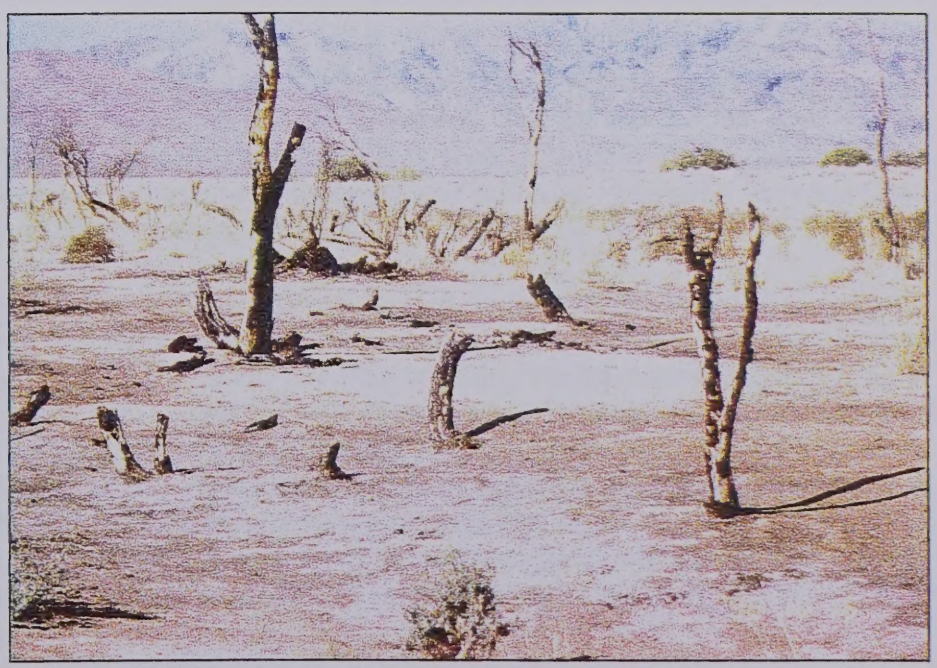


Fig. 1-9. Wildfire in mesquite woodlands southwest of Pahrump, Nye County, Nevada. Above - wildfire on August 4, 1997 burned more than 40 acres of mesquite. Below - same area more than one year later (October 16, 1998). The high-intensity fire burned down into mesquite roots, killing many trees and sterilizing the soil.



Much of the mesquite in the Stump Spring area occurs as shrubby dune mesquite; however, larger shrubs and trees grow along a deeply eroded wash. Recruitment is poor, with about 8% saplings and no evidence of recent seedling establishment. Mistletoe infestation at Stump Spring is low, with about 15% of trees showing light infestation. The Stump Spring site is unique in that it contains several widely spaced, remnant patches of cottonwood (*Populus fremontii* Wats.) and willow (*Salix goodingii* Ball), all of which are dead, dying, or in a state of severe stress. Surface water once occurred at this site, and was documented in the diary of southwestern explorer John C. Fremont (see Fremont 1845) who forged the southern Nevada portion of the Old Spanish Trail. Stump Spring had been a resting place for those traversing the Trail back in the late 1800's, and a portion of the area has been designated as a site of cultural significance (Myrer et al. 1990).

1.3.1.6 Other Sites

Small patches of mesquite are also located in Dry Lake Valley, Cactus and Indian Springs, and in Mesquite Valley close to the community of Sandy Valley. The site at Sandy Valley (Appendix IH) is comprised of sandy mesquite dunes. Legal location is T 24 S, R 56 E, Sec. 14 - 16; T 24 S R 57 E, Sec. 31, 32; T 25 S, R 57 E, Sec. 5. Age class distribution and mistletoe infestation are yet unknown. Most of the mesquite in this area is found around the edge of Mesquite Lake, a dry lake bed located just across the border in California. Of the small amount of mesquite on the Nevada side of the state line, approximately 113 acres are located on private land and 192 acres on public lands. Approximately 4,185 acres of public lands have been identified in the Las Vegas RMP for disposal in the Sandy Valley area. The rare Pahrump Valley Buckwheat occupies about 133 acres within the land disposal area (Fig. 1-10).

The Dry Lake site is located 25 miles northeast of Las Vegas west of Interstate 15 (Appendix IF). Legal location is T 17 S, R 64 E, Sec. 19 and T 17 S, R 63 E, Sec. 24 and 25. This site, which occupies an area about 270 acres in size, lies within a playa and consists of a mixture of mesquite and saltcedar. Mesquite trees are small, shrubby, and relatively young, and mistletoe infestation is very low.

The Cactus and Indian Springs sites are located 45 miles northwest of Las Vegas along Highway 95. All of the mesquite at Indian Springs occurs on private land and is mostly fragmented. Therefore, this Plan will only consider mesquite occurring at the Cactus Springs site. Legal location of the Cactus Springs site is T 16 S, R 55 ½ E, Sec. 11, 12. Mesquite at Cactus Springs occurs on both private and public lands (Appendix IG). This site receives heavy human use from camping and recreational shooting. This site also supports a spring with surface water, but the spring and riparian area are severely degraded from human use. Trees are mostly mature with heavy mistletoe infestation; however, an estimate of age class structure has yet to be determined.

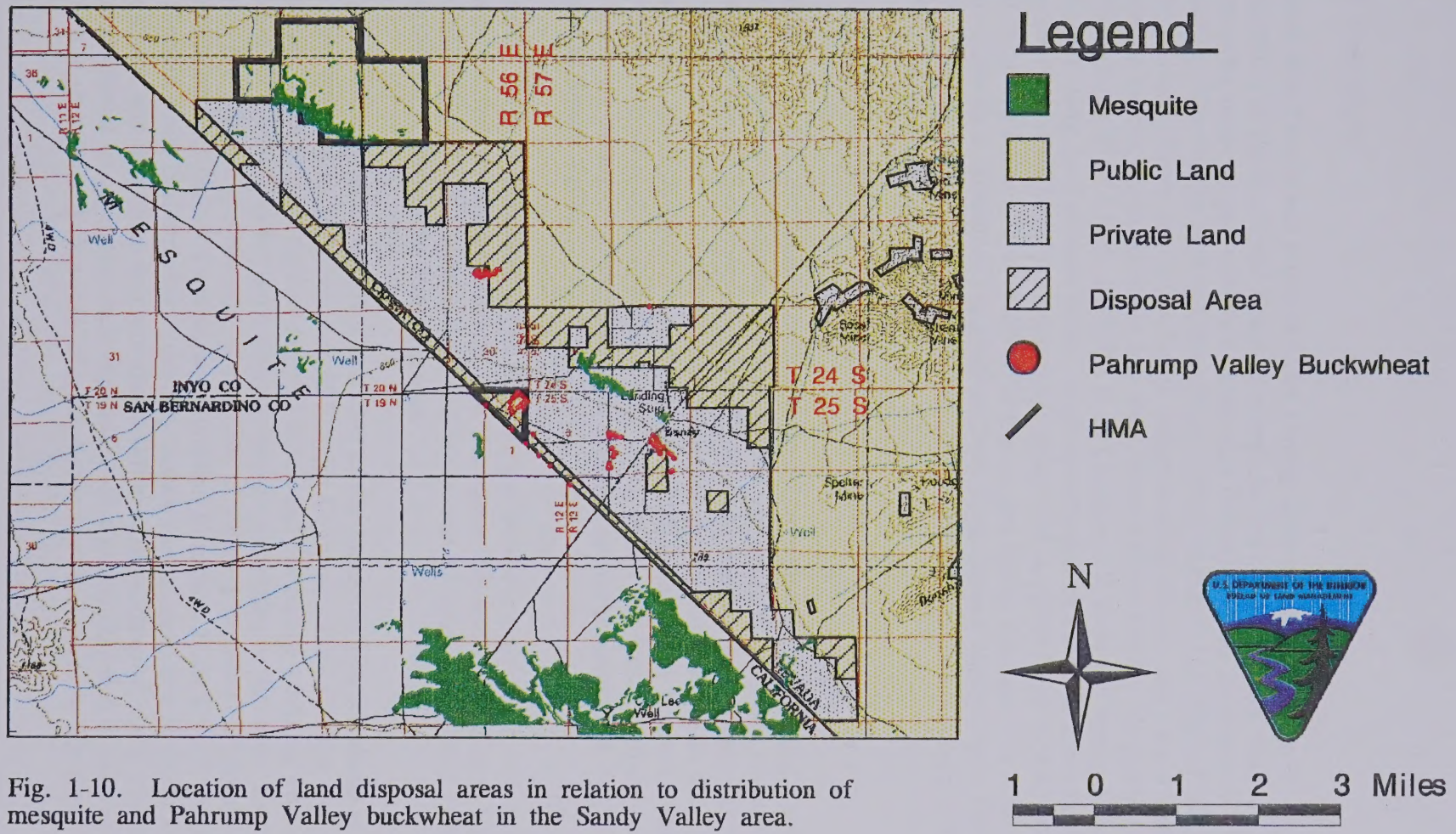


Fig. 1-10. Location of land disposal areas in relation to distribution of mesquite and Pahrump Valley buckwheat in the Sandy Valley area.

1.3.2 Topography

Southern Nye County and much of Clark County have topographic features characteristic of the Basin and Range province, having closed, internal drainage basins separated by steep, rugged mountain ranges that follow a general north-south orientation. The eastern part of Clark County differs in that it has external drainage via the Colorado River, and a few larger valleys such as Muddy and Virgin Valleys do not contain central basins but drain into the Colorado River system. In general, elevation ranges from a high of 11,918 ft on Charleston Peak in the Spring Mountains to 450 feet along the Colorado River. More specifically, elevation of basin floors where mesquite woodlands are found range from: 470 m (1540 ft) at Moapa; 600 m (1970 ft) at Dry Lake; 975 m (3200 ft) at Cactus and Indian Springs; 710 - 720 m (2330 - 2360 ft) at Amargosa Flat; 745 m (2440 ft) at Stewart Valley; 760 - 850 m (2490 - 2790 ft) at Pahrump; 800 - 900 m (2620 - 2950 ft) at Stump Spring; 820 - 830 m (2690 - 2722 ft) at Sandy Valley.

1.3.3 Geology and Minerals

Information for this section is summarized from Longwell et al. (1965) and Cornwell (1972). Mesquite woodlands in southern Nevada are found in the lower elevations of the valley bottoms where deep alluvial and playa lake deposits from Quaternary rock cover the basin floors. The alluvial fans consist of gravel and rubble near the highlands and grade downward into fine sand and silt in the valley bottoms. The playa deposits consist of sand, silt, and clay strata, with a few lenses of fine gravel. Sand dunes are prominent features in some areas, in particular Amargosa Flat, Stump Spring, and Sandy Valley.

No Mining Plans of Operation are on file with the BLM for sites within any of the identified Habitat Management Areas. The Amargosa Flat area has 172 open claims filed, Pahrump contains 2 open claims, and Moapa has 11 open claims filed. One Mining Notice is filed in the Pahrump area.

A large private clay pit in the playa just west of the Amargosa Flat woodland is owned and operated by IMV Division of Floridin Company. IMV Floridin has patent applications south of their current patented lands, and has on file a Mining Plan of Operation (N54-90-001P) for three separate clay pit operations in the area. Each of the three pits mines a specific type of clay, one of which is sepiolite and occurs west of the southernmost part of the mesquite woodland in section 21 of T 17 S, R 51 E. IMV Floridin states that sepiolite is the only known clay mineral that is stable at high temperatures, and only three deposits are known to exist worldwide. IMV Floridin has expressed interest in expanding their exploration of sepiolite clay east of their existing operation in section 21, which may affect mesquite trees that occur in this area.

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A large private clay pit in the playa just west of the Amargosa Flat woodland is owned and operated by IMV Division of Florida Company. IMV Florida has pending applications south of their current patented lands, and has on file a Mining Plan of Operation (N34-90-0017) for three separate clay pit operations in the area. Each of the three pits mines a specific type of clay, one of which is sepiolite and occurs west of the southernmost part of the mesquite woodland in section 21 of T. 17 S., R. 51 E. IMV Florida states that sepiolite is the only known clay mineral that is stable at high temperatures, and only three deposits are known to exist worldwide. IMV Florida has expressed interest in expanding their exploitation of sepiolite clay east of their existing operation in section 21, which may affect mesquite trees that occur in this area.

1.3.4 Groundwater Hydrology

In southern Nevada, mesquite behaves as an obligate phreatophyte; that is, its existence depends upon the availability of a relatively shallow and permanent groundwater source. Groundwater level, drainage patterns, and the soil's water-holding capacity all contribute in determining the distribution of mesquite in the eastern Mojave Desert. Aerial photos of Pahrump Valley taken in 1980 show the close association between mesquite distribution and the east-west drainage pattern in the valley (Fig. 1-11).

Amargosa Flat, Stewart Valley, Pahrump, and Stump Spring HMAs occur within closed basins with internal drainage systems, whereas the Moapa HMA has external drainage into the Colorado River System via the Muddy River. Amargosa Flat occurs in the Amargosa Desert Hydrographic Area (#230) in the Death Valley Basin; the Stewart Valley, Pahrump, and Stump Spring sites occur in the Pahrump Valley Hydrographic Area (#162) in the Central Region; and the Moapa site occurs in the Lower Moapa Valley Hydrographic Area (#220) in the Colorado River Basin. Groundwater flows both through the alluvium and along solution cavities and fractures in Paleozoic carbonate rocks that underlie the basins (Cornwall 1972).

In Amargosa Desert and Pahrump Valley areas, groundwater recharge is derived principally from precipitation in the higher mountains, in particular the Spring Mountains. Groundwater flow in the valley fill in Amargosa Desert generally moves southeastward from north of Big Dune toward Death Valley Junction. In Pahrump Valley, groundwater flows from the Spring Mountains southwestward across the valley toward the Nopah Range. A fault in Pahrump Valley mapped by Malmberg (1967) occurs in the valley fill and extends southeast from Stewart Valley along the state line for about 15 miles. The occurrence of springs and mesquite stands along the northeast side of the fault suggests that it forms a partial barrier to groundwater flow (see Fig. 1-11). Groundwater movement in the Lower Moapa Valley is in the general direction of surface flow, moving from the mountains toward the center of the valley, but is modified somewhat by the general flow of groundwater from the northern part of the area to the southern part where it is discharged into the Muddy River Valley.

Water levels recorded for eight wells in the Amargosa Desert between 1952 and 1957 show a relatively constant level, whereas water levels recorded between 1957 and 1962 show a decline (Walker and Eakin 1963). Declines ranged from 0.1 to 6.1 feet over a 5-year period, with an average yearly decline of 0.7 feet. In the Lower Moapa Valley, the trend has been very slow local decline of groundwater levels (Rush 1964). Water levels of wells drilled in Pahrump Valley generally have been declining since the first wells were constructed in 1913 (Harrill 1982). During the years 1962-1975, water levels declined between 1 and 4½ feet per year, with the greatest declines occurring along the lower edge of the Pahrump and Manse alluvial fans and lesser rates of water level decline occurring lower in the valley bottom.

Fig. 1-11. Aerial photo of mesquite woodlands in Pahrump Valley depicting mesquite distribution in relation to drainage pattern.

Most wells drilled in Pahrump Valley from 1913 to 1962 were for irrigation of cotton and alfalfa. Pumpage reached a maximum high in 1968 and then began to decrease after land was taken out of agricultural production and sub-divided for real estate development. However, if this land is fully developed, it is expected that pumpage will return to about the same level as in 1968. Harrill (1982) estimated that, as of 1975, pumping had created an overdraft of approximately 11,000 acre-feet per year on the groundwater supply in Pahrump Valley. An analysis of data on static water levels obtained from the Nevada State Water Engineer's office in Las Vegas for 651 wells drilled within a 1-mile radius of a mesquite woodland in the Pahrump area (Krueger 1998) detected a significant downward trend in static water level for wells drilled between the years 1953 and 1996 (Fig. 1-12). In October 1997 one observation well was drilled at each of four sites (Moapa, Stewart Valley, Pahrump, and Stump Spring) for the purpose of determining current groundwater level at each site, as well as for long-term monitoring of groundwater fluctuations. Figure 1-13 shows a comparison of groundwater levels among the four sites.

1.3.5 Soils

Soils at Amargosa Flat are playa soils of the Corbilt-Bluepoint association. Corbilt soils are coarse-loamy, mixed (calcareous), thermic Typic Torriorthents (gravelly fine sandy loam) and Bluepoint soils are mixed, thermic Typic Torripsamments (loamy fine sand). Mesquite is found growing along drainages and in sand dunes scattered throughout the area. Soils at Stewart Valley and Pahrump are Aquic Xerofluvents, fine-silty, mixed (calcareous), thermic, and are clay loams that are deep and moderately well-drained. Stump Spring soils are fine-silty, gypsic, thermic Typic Gypsiorthids of the Tanazza series, which consists of very deep, well drained, fine sandy loams that formed in alluvium and reworked lacustrine sediments. The Tanazza soils are on remnant shoreline terraces. Soil classification at Moapa is mixed, thermic Typic Torripsamments, which is a Toquop fine sand with 0 to 2 percent slopes. This is deep, excessively drained soil from fine sandy alluvium derived from sandstone. In general, soils at Moapa and Amargosa Flat in which mesquite grow are sandy, whereas soils at Pahrump and Stewart Valley are of a higher clay content. Table 1-2 compares soil texture profiles obtained during drilling of observation wells for four mesquite woodland sites.

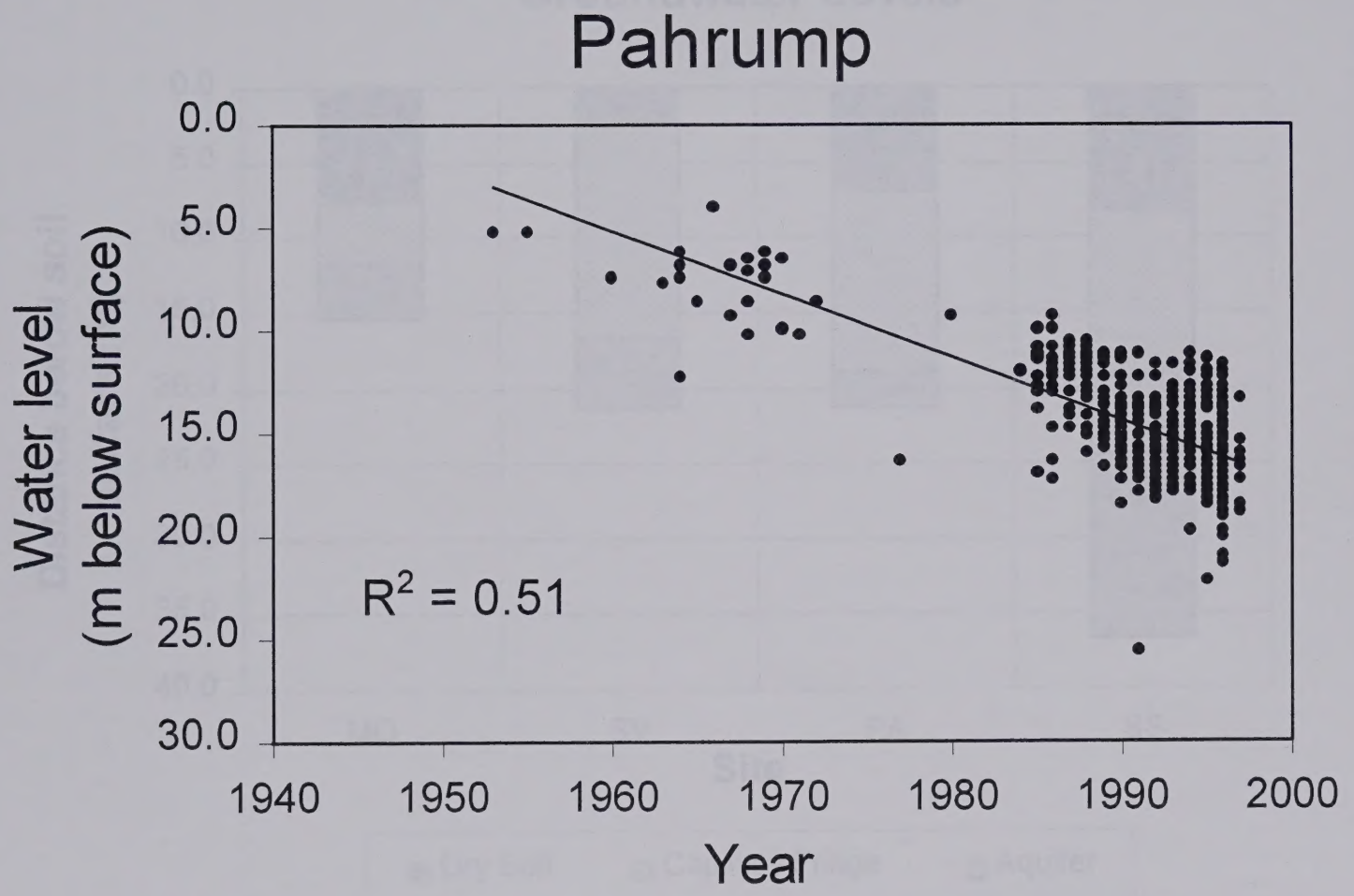

Fig. 1-12. Relationship between static water level and year well was drilled for 651 wells located within a 1-2 mile radius of the Pahrump mesquite site, Nye County, Nevada.

R² = 0.07
Year
1840
1820
1800
1810
1860
1880
5000
Water level
(m below surface)
0.0
2.5
5.0
7.5
10.0
12.5
15.0
Barium

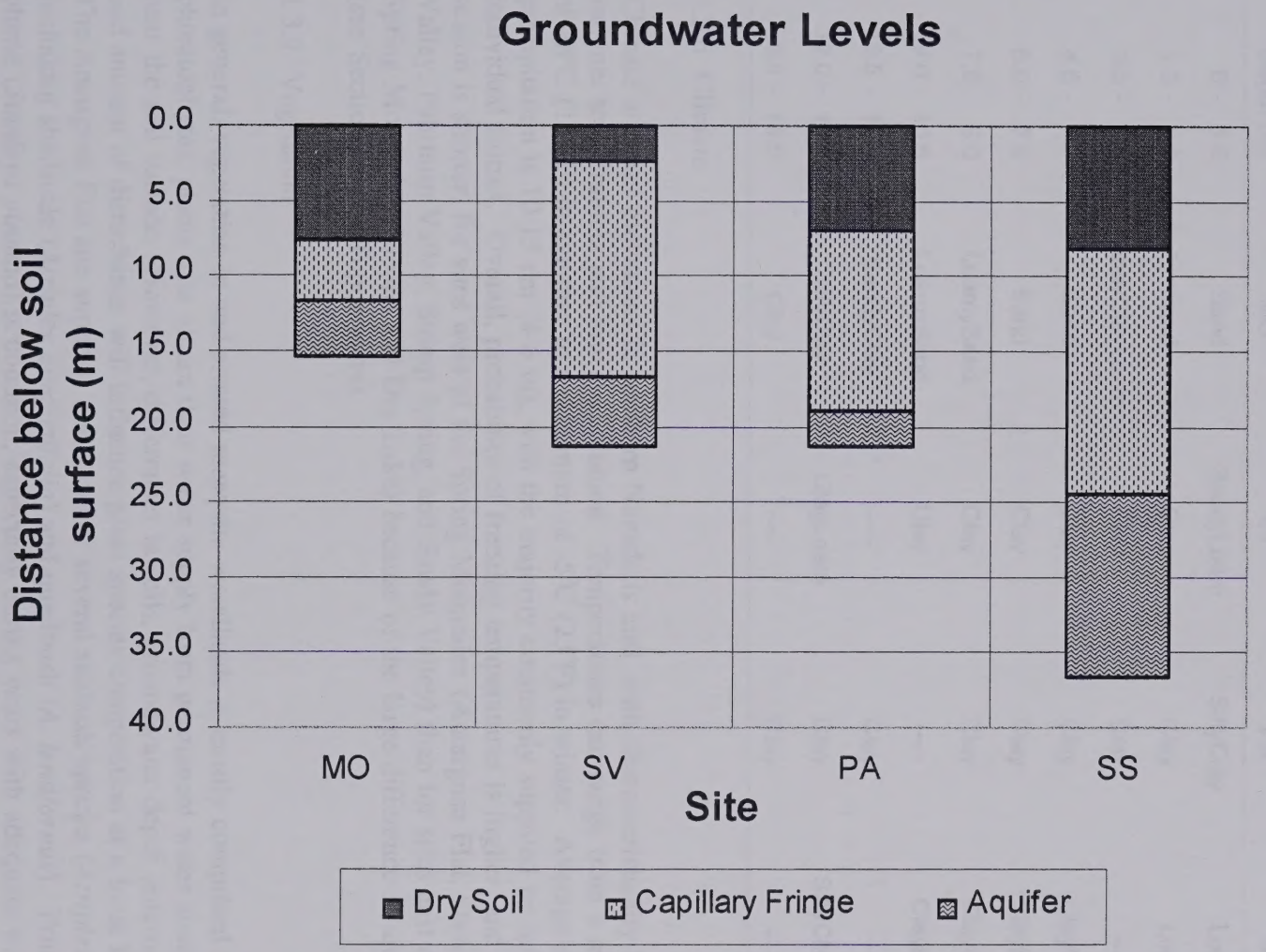

Fig. 1-13. Groundwater levels determined from the drilling of observation wells in October 1997 at four mesquite woodland sites in southern Nevada. MO = Moapa; SV = Stewart Valley; PA = Pahrump; SS = Stump Spring. The bottom of each bar represents the depth of the well at each site.

Groundwater level
Distance below soil surface (m)
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
CM
V5
A4
E3
Soil Profile
Cobble/Rubble
Gravel
Sand
Silt
Clay

Table 1-2. Soil texture profiles determined from samples taken at 1.5-m intervals during drilling of observation water wells at four mesquite woodland sites in southern Nevada. MO = Moapa; SV = Stewart Valley; PA = Pahrump; SS = Stump Spring.

	Site			
Depth (m)	MO	SV	PA	SS
0 - 1.5	Sand	SandyLoam	SiltyClay	Loam
1.5 - 3.0	Sand	Clay	Clay	Loam
3.0 - 4.5	SandyClayLoam	Clay	Clay	-----
4.5 - 6.0	Sand	Clay	Clay	ClayLoam
6.0 - 7.5	Sand	Clay	Clay	ClayLoam
7.5 - 9.0	LoamySand	Clay	Clay	ClayLoam
9.0 - 10.5	LoamySand	Clay	-----	ClayLoam
10.5 - 12.0	SandyClay	-----	Clay	-----
12.0 - 13.5	SiltyClay	ClayLoam	Clay	SiltyClayLoam
13.5 - 15.0	Clay	-----	Clay	-----

1.3.6 Climate

Climate at lower elevations in southern Nevada is arid, with characteristically high summer temperatures and low precipitation. Temperatures can range from a maximum of 48°C (118°F) in summer to a minimum of -5°C (23°F) in winter. Average annual precipitation is 10-15 cm (4-6 in), with the majority commonly supplied by infrequent, individual storms. Overall, probability of freezing temperatures is higher, and growing season is shorter, for sites west of the Spring Mountains (Amargosa Flat, Stewart Valley, Pahrump Valley, Stump Spring, and Sandy Valley) than for sites east of the Spring Mountains (Moapa and Dry Lake) because of the large difference in altitude (see Section 1.3.2 - Topography).

1.3.7 Vegetation

In general, vegetation in and around mesquite woodlands is mostly comprised of phreatophytes, plants that obtain their water supply from permanent water sources at or near the soil surface. However, differences in soils, groundwater depth, microclimate, and amount of disturbance will influence plant species composition at a local level. The Amargosa Flat site supports a mixture of several saltbush species (*Atriplex* spp.), including shadscale (*Atriplex confertifolia*) and quailbush (*A. lentiformis*). Prince's plume (*Stanleya pinnata*) is common, especially during years with adequate winter and spring rainfall. Vegetation becomes sparse to the west, and is absent in the playa.

The Moapa woodland is comprised of a sparse understory of goldenweed (*Haplopappus acradenius* var. *erimophilous*), wolfberry (*Lycium cooperi*), wild ryegrass (*Elymus cinereus*), and six-weeks fescue (*Vulpia octiflora*). Seepweed (*Suaeda torreyana*) and Russian thistle (*Salsola paulsenii*) occur along the edge of the woodland. Salt scrub consisting mainly of four-wing saltbush (*A. canescens*) occurs to the west of the woodland, and creosote bush (*Larrea tridentata*) dominates the landscape to the east. Three hundred meters to the west, saltcedar (*Tamarix ramosissima*) has invaded the area, and has spread along the banks of Meadow Valley Wash.

The Stewart Valley site supports an understory of wild ryegrass interspersed with patches of saltgrass (*Distichlis spicata*). Surrounding vegetation is salt scrub consisting mainly of shadscale and quailbush. About 800 m east of the woodland the salt scrub is replaced by creosote bush. Vegetation is absent in the playa west of the woodland.

The understory at Pahrump consists mainly of red brome (*Bromus rubens*) interspersed with patches of wild ryegrass. Seepweed and rabbitbrush (*Chrysothamnus* spp.) occur along the edge of woodland patches, along with shadscale, quailbush, and four-wing saltbush that also comprise the surrounding desert salt scrub vegetation. Alkali sacaton (*Sporobolus airoides*) occurs in patches where soils have better drainage. Several species of buckwheat (*Eriogonum* spp.) occur in small to large patches in open areas between mesquite stands at Pahrump. Saltcedar has begun invading parts of the woodland. A comparison of USGS orthophotoquads from 1976 and GPSd vegetation data from 1998 documents the establishment of saltcedar in this area sometime after 1976.

Vegetation along the main wash at Stump Spring consists of a patchwork of salt scrub species including quailbush, four-wing saltbush, and cattle spinach (*A. polycarpa*) along with rabbitbrush, seepweed, and wolfberry. Pepper grass (*Lepidium fremontii*), snakeweed (*Gutierrezia sarothrae*), prince's plume, and arrowweed (*Pluchea sericea*) grow in and along the edge of the wash, and patches of saltcedar have invaded portions of the wash. The surrounding area is dominated by salt scrub with a secondary component consisting of creosote bush interspersed with Mormon tea (*Ephedra nevadensis*).

1.3.8 Wildlife

Nevada's wildlife is under the managing authority of the Nevada Division of Wildlife.

Mesquite woodlands occupy less than 0.2% of the land area in Clark and southern Nye Counties, yet these woodlands support a disproportionately greater number of wildlife species than the surrounding desert scrub. At least 65 avian species have been observed using mesquite woodlands as migratory stopover sites, breeding sites, and

wintering areas. At least 30 species of birds are known to breed in southern Nevada mesquite stands, and 21 species of migratory passerines have been observed in woodlands during the migration period in May. Eight raptor species have been observed, including three species [great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), and sharp-shinned hawk (*Accipiter striatus*)] known to breed in the mesquite. Mourning dove (*Zenaida asiatica*) and Gambel's quail (*Callipepla gambelii*) are common game species found in mesquite stands. See Appendix II for a list of avian species found in southern Nevada mesquite woodlands.

Small mammals that occur in the eastern Mojave Desert include approximately 10 species of bats and over 20 species of rodents. Common lagomorphs include black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus auduboni*). Carnivores include coyote (*Canis latrans*), badger (*Taxidea taxus*), and kit fox (*Vulpes macrotis*). Mountain lion (*Felis concolor*) is rare, but is known to inhabit rugged mountain ranges in the area. Large herbivores include desert bighorn sheep (*Ovis canadensis*) and mule deer (*Odocoileus hemionus*). Many reptiles occur in southern Nevada such as western whiptail lizard (*Cnemidophorus tigris*), side-blotched lizard (*Uta stansburiana*), and zebra-tailed lizard (*Callisaurus draconoides*). Common snakes include gopher snake (*Pituophis melanoleucus*), Mojave rattlesnake (*Crotalus scutulatus*) and red coachwhip (*Masticophis flagellum*). See Appendix III for a more comprehensive list of reptile species known to occur in and around mesquite woodlands in southern Nevada.

1.3.9 Threatened, Endangered, and Sensitive Species

There are currently no known species inhabiting the Mesquite Woodland Habitat Management Areas that are federally listed as threatened or endangered. However, southwestern willow flycatcher (*Empidonax traillii extimus*), an endangered species, may use woodlands as stopover sites during migration. Threatened or endangered species that may occur in habitats adjacent to Mesquite Woodland HMAs include desert tortoise (*Gopherus agassizii*), threatened status; bald eagle (*Haliaeetus leucocephalus*), threatened status; and peregrine falcon (*Falco peregrinus*), endangered status. However, peregrine falcon has been proposed for delisting.

Phainopepla (*Phainopepla nitens*) is a special status species in Nevada and is listed on the BLM Sensitive Species List for Nevada. Of the eight Mesquite HMAs, Moapa supports the only relatively large Phainopepla breeding population. Ten breeding pairs in 1996 and 16 breeding pairs in 1997 were known to occupy a 12-ha area of the woodland. Nesting success for each year was calculated using the Mayfield method (1961, 1975). Nest survival probabilities were 0.413 for 1996 and 0.537 for 1997 (Krueger 1998). Phainopepla breeds at all sites, but densities are much lower than at Moapa. Moapa supports a fairly dense breeding population most likely because mistletoe berry production is much higher at Moapa than at the other sites. The Moapa site is also flanked on the west and south by irrigated agricultural fields. The

additional water available from irrigation may also contribute to higher insect populations, thus increasing the attractiveness of this site to birds.

Other avian species on the BLM Sensitive Species List that are known to use mesquite woodlands for foraging, breeding sites, or migratory stopovers include:

Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsoni*
Yellow warbler	*Dendroica petechia*
Yellow-breasted chat	*Icteria virens*
MacGillivray's warbler	*Opororis tolmiei*
Bell's vireo	*Vireo bellii*
Gray vireo	*Vireo vicinior*
Orange-crowned warbler	*Vermivora celata*
Wilson's warbler	*Wilsonia pusilla*

Other faunal species on BLM's Sensitive Species List that may occur within or adjacent to mesquite management areas are:

Greater western mastiff bat	*Eumops perotis californicus*
Allen's big-eared bat	*Idionycteris phyllotis (=Plecotus p.)*
California leaf-nosed bat	*Macrotus californicus*
Small-footed myotis	*Myotis ciliolabrum*
Long-eared myotis	*Myotis evotis*
Fringed myotis	*Myotis thysanodes*
Cave myotis	*Myotis velifer*
Long-legged myotis	*Myotis volans*
Yuma myotis	*Myotis yumanensis*
Big free-tailed bat	*Nyctinomops macrotis (=Tadarida m., T. molossa)*
Pale Townsend's big-eared bat	*Plecotus townsendii pallescens*
Pacific Townsend's big-eared bat	*Plecotus townsendii townsendii*
Spotted bat	*Euderma maculatum*
Gila monster	*Heloderma suspectum*
Chuckwalla	*Sauromalus obesus*

Two special status plant species occur in association with the mesquite woodlands in southern Clark and Nye Counties: Pahrump Valley buckwheat (*Eriogonum bifurcatum*) and Parish's phacelia (*Phacelia parishii*).

Pahrump Valley buckwheat is a low, spreading annual with a very narrow endemic range of only three valleys along the Nevada-California border: Stewart Valley (Nye Co., NV), Pahrump Valley (Nye Co., NV and Inyo Co., CA), and Mesquite Valley (Clark Co., NV, Inyo and San Bernardino Cos., CA). This geographical range is within the eastern Mojave Desert. This species occurs in heavy clay soil, saline flats,

and rolling hills around dry lake playas. Major plant associates are mesquite, shadscale, and seepweed. A status report documenting all known information on the taxon was completed in 1988. The episodic nature of flowering events precluded a comprehensive survey until 1998 when intensive surveys were initiated. The results of known locations of Pahrump Valley buckwheat are presented in Appendix IC, ID, and IH. An analysis of occurrences on BLM land vs. private lands shows that significant extirpations are occurring in Sandy Valley where most of the land is private, while most of the populations in Pahrump and Stewart Valleys are on public land.

Parish's phacelia is another annual that occurs adjacent to dry lake beds. A status report for this taxon is in preparation. It is more widely distributed than the Pahrump Valley buckwheat, occurring in 21 known sites on about 5,000 acres in California, Arizona, and Nevada. Like the buckwheat, this plant is highly ephemeral and numbers can range from a few to millions depending upon favorable precipitation. Parish's phacelia was found in Stewart Valley on the edges of playas in fine-textured alkaline soils (see Appendix IC).

1.3.10 Livestock

Commercial livestock ranching has existed in southern Nevada since the 1880s. Currently, seven allotments intersect with Mesquite Woodland Habitat Management Areas. Table 1-3 summarizes the current status of grazing allotments within the eight HMAs.

Table 1-3. Las Vegas District grazing allotments occurring in Mesquite Woodland Habitat Management Areas.

Mesquite Management Area	Allotment Name	Operator	Average Licensed Use 1984-1993 (AUMs)	Period of Use	Acres (BLM)	Status
Moapa	Glendale	C. Hester	0	No Use	23,595	closed
Amargosa Flat	Mt. Stirling	Bow and Arrow Cattle Co.	517	Y/L[a]	126,888	closed
Stewart Valley	Unallotted	----------	----------	----------	----------	----------
Pahrump	County Line	----------	0	----------	6,720	closed
Stump Spring	Stump Spring	R. Wiley	0	No Use	49,557	closed
Sandy	Black Butte	R. Spurlock	0	No Use	40,861	closed
Dry Lake	Dry Lake	J. Hendricks	0	Mar-May	43,873	closed
Cactus Springs	Wheeler Slope	----------	0	----------	72,277	closed

[a] Y/L = Year Long

The Amargosa Flat HMA is the only site that falls within an allotment with a recent grazing history. This area falls within the Mt. Stirling grazing allotment, which had

been classified as perennial range. The portion of the allotment within the Habitat Management Area had been managed under grazing Prescription 2 (BLM 1991), which is season-long grazing use with restrictions on the utilization level of key forage species. The Moapa and Stump Spring HMAs have been grazed in the past, but no record of grazing could be found for the last 10 years. Stewart Valley and the majority of the Pahrump site have no formal grazing histories, and occur in unallotted areas. A small portion of the Pahrump HMA falls within the County Line allotment south of Pahrump, but no grazing history could be found for this allotment. The Sandy Valley, Dry Lake, and Cactus Springs areas have had either low or no use since at least 1984.

All allotments intersecting with Mesquite HMAs have been closed to future grazing according to specific directions identified in the RMP.

1.3.11 Wild Horses and Burros

Two Wild Horse and Burro Herd Management Areas intersect with the Amargosa Flat Mesquite Woodland Habitat Management Area. Table 1-4 lists the current population estimates and Appropriate Management levels for the Herd Management Areas. The eastern portion of the mesquite woodland lies within Johnnie Herd Management Area, while the western edge of the stand is found in the Ash Meadows Herd Management Area. A fence constructed along Highway 160 prevents horses and burros from crossing into the mesquite stand from Johnnie, and most horses and all burros were trapped and removed from the west side of the highway. However, a herd of approximately 8-9 horses remains in the Amargosa Flat mesquite woodland, even though periodic efforts have been made to trap and remove the horses from the area. The Cactus Springs area falls within the Wheeler Pass Herd Management Area, which is managed by the Forest Service. No Herd Management Areas occur within the other mesquite sites.

Table 1-4. Population estimates and Appropriate Management Levels for Herd Management Areas at Amargosa Flat and Cactus Springs Mesquite Woodland Habitat Management Areas.

Herd Management Area	Current Population Estimate		Estimated AMLs[a]	
	Horses	Burros	Horses	Burros
Ash Meadows	0	0	0	0
Johnnie	49	37	50	75
Wheeler Pass (managed by Forest Service)				

[a] As stated in the Las Vegas Resource Management Plan.

1.3.12 Cultural Resources

Portions of two Mesquite HMAs intersect with culturally significant areas. The Stump Spring HMA includes the site of a prehistoric camp and historic trail, and is eligible for nomination to the National Register of Historic Places (see Myhrer et al. 1990). A portion of the southern route of the Old Spanish Trail occurs at this site. Consequently, per the RMP, approximately 640 acres at Stump Spring have been designated as an Area of Critical Environmental Concern (ACEC)(Fig. 1-14). Approximately 193 acres of mesquite habitat is located within the ACEC. Resource constraints for the Stump Spring ACEC as described in the RMP are as follows:

- Retain in federal ownership. Designate as ROW avoidance areas. Close to mineral material ROWs.
- Close to locatable minerals, salables and solid leasables. Open to fluid minerals subject to no surface occupancy stipulations.
- Manage consistent with the surrounding allotment and herd management area, if applicable.
- Require reclamation of temporary roads. Authorize new roads in response to specific authorized actions only, ensure access to private property.
- Limited OHV/ORV designation, consistent with OHV designations of surrounding areas.

The Amargosa Flat HMA has also been determined to hold cultural significance. An Environmental Assessment was conducted for this area in 1991 to determine the potential impacts associated with a proposed action for mesquite woodcutting (EA-NV-054-91-037). Results of a cultural reconnaissance level (Class II) survey detected three dune camp sites that are considered to hold data important in the history of the region (CR5-1076P). These archaeological properties were assigned site number CrNV-53-5686/26Ny7799, and were considered eligible for nomination to the National Register of Historic Places. As a result of the significant archaeological findings, the proposed action was denied and the area closed to further woodcutting. A portion of the mesquite woodland at this site falls within a designated ACEC (Fig. 1-15). The ACEC encompasses approximately 6,800 acres of public land, of which 751 acres is mesquite vegetation. About 1,179 acres of mesquite habitat in the area is not included within the boundary of the ACEC. Resource constraints for the Amargosa ACEC as described in the RMP are as follows:

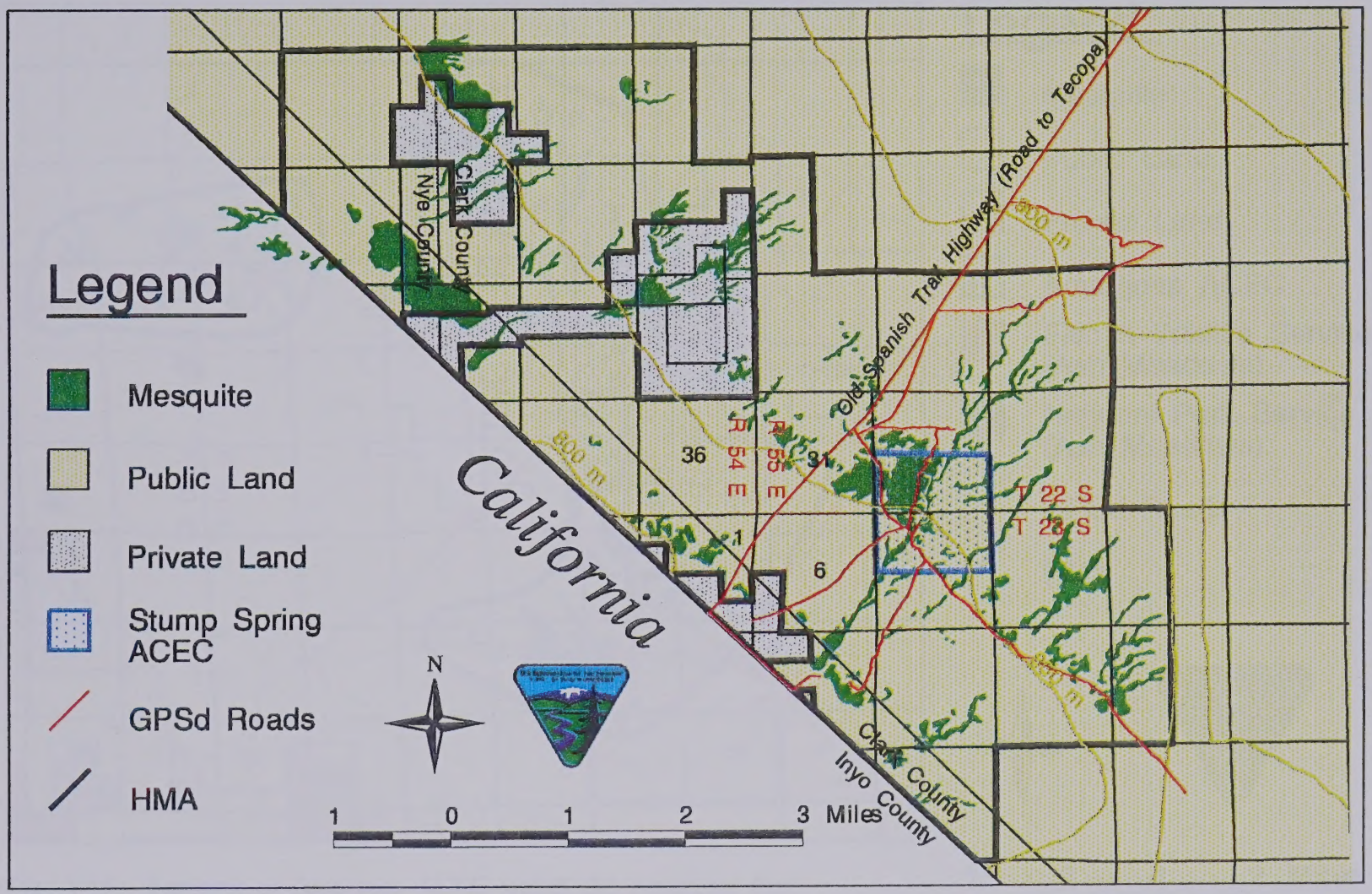

Fig. 1-14. Location of Stump Spring ACEC within the Stump Spring Mesquite Woodland Habitat Management Area.

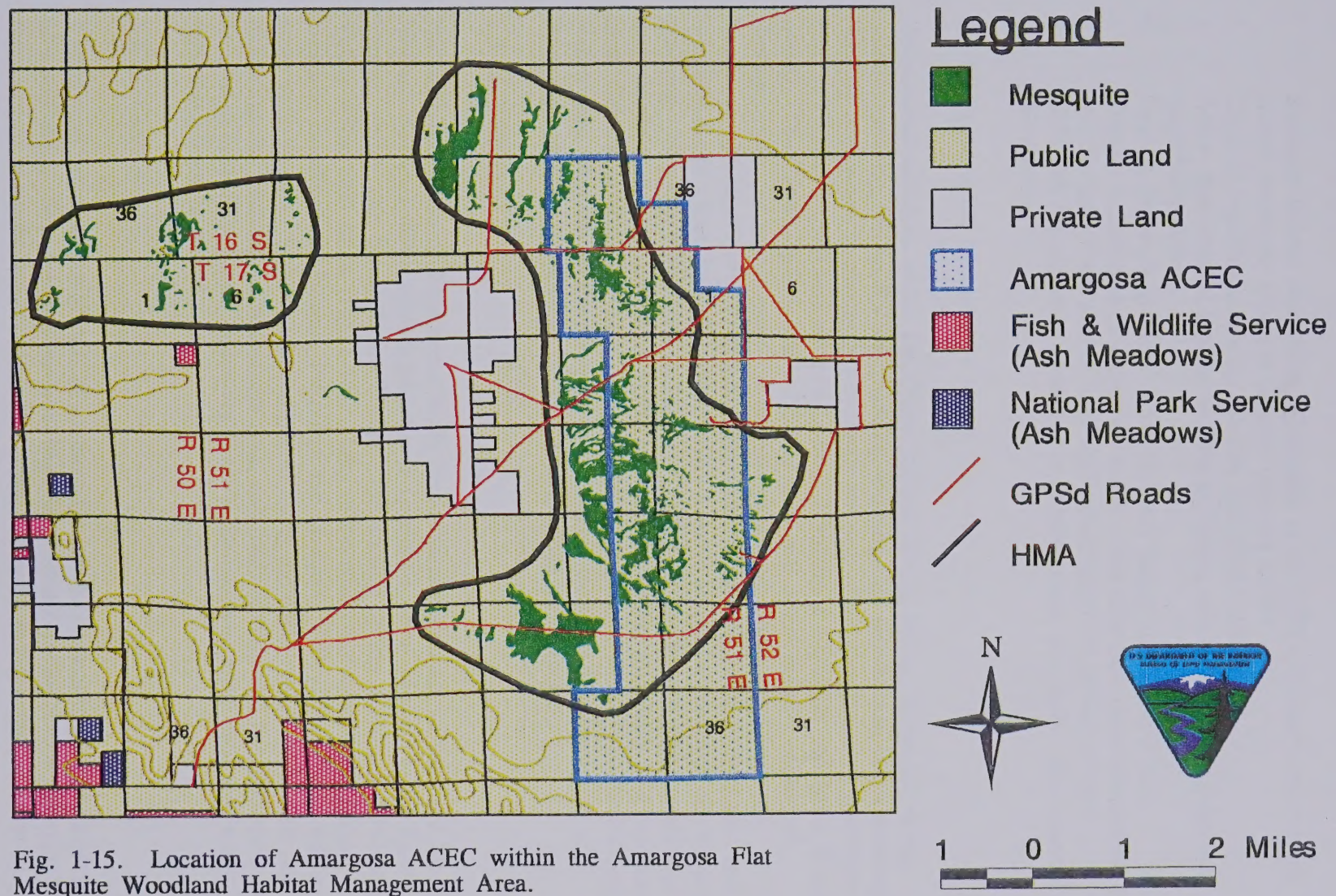

Fig. 1-15. Location of Amargosa ACEC within the Amargosa Flat Mesquite Woodland Habitat Management Area.

- Retain in federal ownership. Designate as an ROW avoidance area except within corridors. Close to mineral material ROWs.
- Close to locatable minerals, salables and solid leasables.
- Allow fluid mineral leasing, subject to Timing and Surface Use Constraint special stipulations.
- Open to livestock grazing. AML for wild horses and burros = zero.
- Require reclamation of temporary roads. Authorize new roads in response to specific authorized actions only, and ensure access to private property.
- OHV/ORV designation is limited to existing roads and trails. No competitive ORV events.

1.3.13 Recreational Resources

Recreational activities within the HMAs include hiking, biking, horseback riding, wildlife viewing, OHV/ORV use, hunting, trapping, and recreational target shooting. Hunting is common in mesquite woodlands because of the abundance of gamebirds such as Gambel's quail and mourning dove. Trapping is a popular activity at Stump Spring. The Cactus Springs site is heavily used year round both by organized shooting clubs and casual users. A blackpowder shoot (Purgatory Plainsmen Rendezvous) is held every President's Day weekend at the Cactus Springs site, and typically draws about 250-400 people. Dry Lake is an intensively used site for target shooting. Mesquite woodlands in Pahrump Valley are particularly popular sites for early morning and late afternoon walks because of its close proximity to a populated area. Several informal dirt bike sites have been constructed throughout the Pahrump Valley area. Activity in the mesquite woodlands adjacent to the community of Pahrump continues to increase as the Pahrump urban area expands.

1.3.14 Wilderness

No wilderness areas or Wilderness Study Areas occur within any of the eight Mesquite HMAs. However, three wilderness areas in California occur adjacent to the Pahrump, Stewart Valley, and Sandy Valley HMAs - the Resting Spring, Nopah, and Pahrump Valley Wilderness Areas (Fig. 1-16). Many of the roads that wind through the mesquite woodlands in Stewart, Pahrump, and Mesquite Valleys lead to the wilderness areas in California. Signs have been posted along the California-Nevada state line indicating the boundary of wilderness area, and roads leading into the wilderness areas have been posted as closed. However, these roads continue to be used, and many signs have been destroyed.

1.3.15 Forestry

Virtually all mesquite woodlands in southern Nevada have been exposed to high levels of woodcutting. Woodcutting has now been suspended because of new information on the status of mesquite woodlands in this area. Mesquite is a renewable resource;

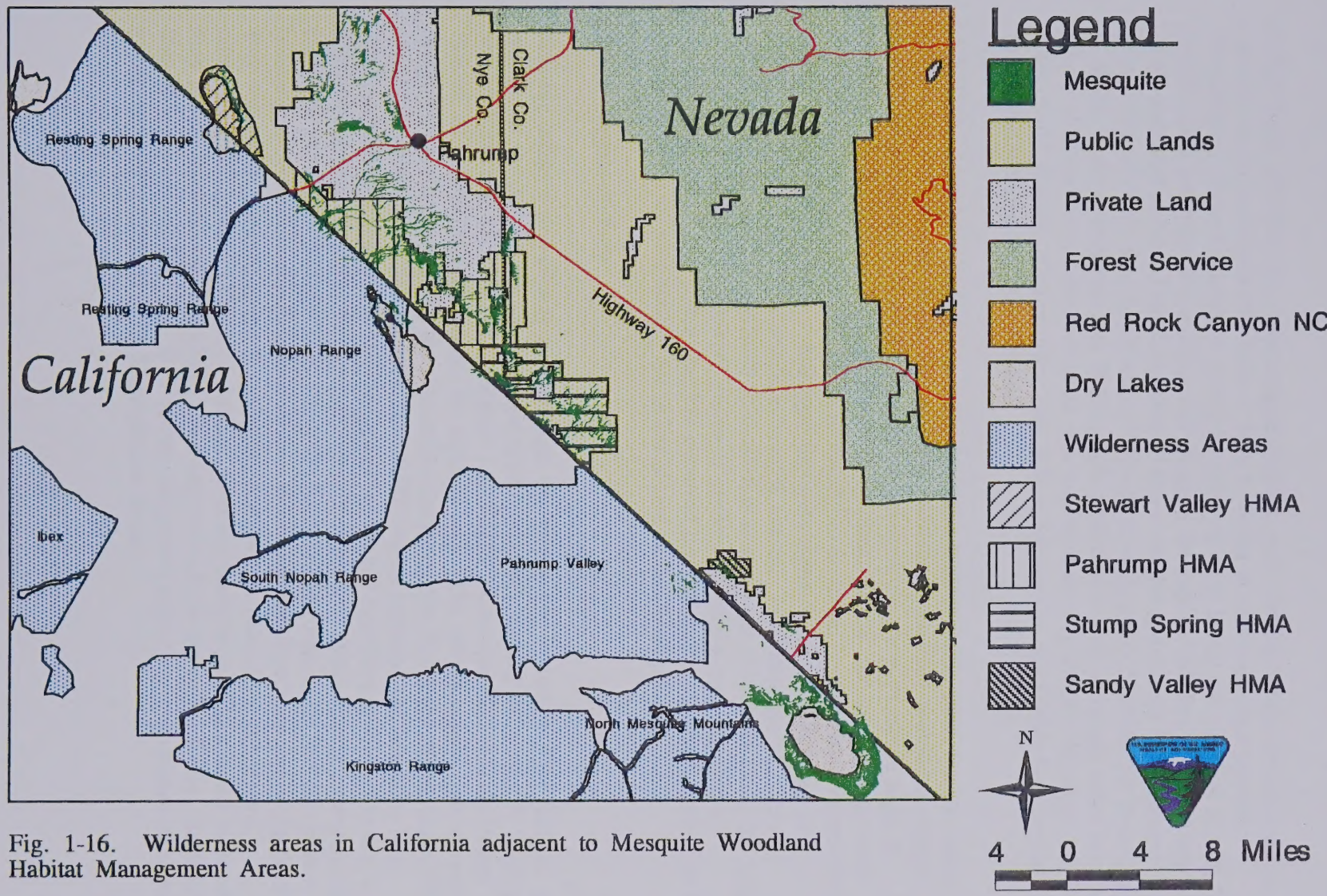

Fig. 1-16. Wilderness areas in California adjacent to Mesquite Woodland Habitat Management Areas.

however, in arid climates mesquite germination and seedling establishment require a specific set of environmental factors, which results in infrequent and episodic recruitment. Once established, mesquite trees are very hardy and difficult to kill, but woodcutting promotes resprouting and changes the original tall tree into a shorter, multi-stemmed shrub. Transformation of large, old mesquite trees into younger, smaller shrubs may have implications towards management of habitat for Phainopepla. A recent study determined that Phainopepla preferred to nest in larger, taller trees with heavy mistletoe infestation, which in turn increased nesting success (Krueger 1998). Loss of old, heavily infested trees may reduce the amount of suitable breeding habitat for Phainopepla in southern Nevada.

All HMAs have been exposed to woodcutting at some point in time, but the extent and severity of woodcutting varies among sites. Although currently prohibited, illegal woodcutting continues to occur. Levels of woodcutting are particularly high in Pahrump Valley because of easy access to the area, largely due to the many roads throughout the woodlands and close proximity to an urban community. Woodcutting is also a problem at Moapa. Although there are signs of past woodcutting at Amargosa Flat, evidence of recent activity is absent. At Stump Spring, signs of woodcutting activity are confined to those few areas of the woodland along the wash with direct road access. Stewart Valley is probably the area least affected by woodcutting. Recent woodcutting has occurred throughout the northern portion of the stand, but signs of past cutting are either absent or obscured by age.

1.3.16 Rights-of-Way

Existing utility rights-of-way pass through the Moapa and Amargosa Flat HMAs. A wildfire at the Moapa site in 1995 damaged powerlines, cutting off power to houses and businesses as far away as northwest Las Vegas. Subsequently, Nevada Power cleared all vegetation from within the right-of-way. The only previous right-of-way corridors were designated in the Esmeralda-Southern Nye Resource Management Plan and occur in southern Nye County. The RMP, which replaced the Southern Nye RMP, modified this corridor and designated additional corridors in Clark County in order to concentrate utility lines within specific areas and avoid widely scattered utility rights-of-way. One corridor runs along the Nevada-California state line and bisects the mesquite woodland in the Pahrump HMA. All future applicants for utility rights-of-way will be encouraged to construct utility lines within one of the designated corridors. The potential threat of damage to utility lines by wildfires in the mesquite may induce right-of-way holders to clear vegetation from the right-of-way, resulting in loss of mesquite habitat. Fig. 1-17 shows designated right-of-way corridors in relation to Mesquite Woodland Habitat Management Areas.

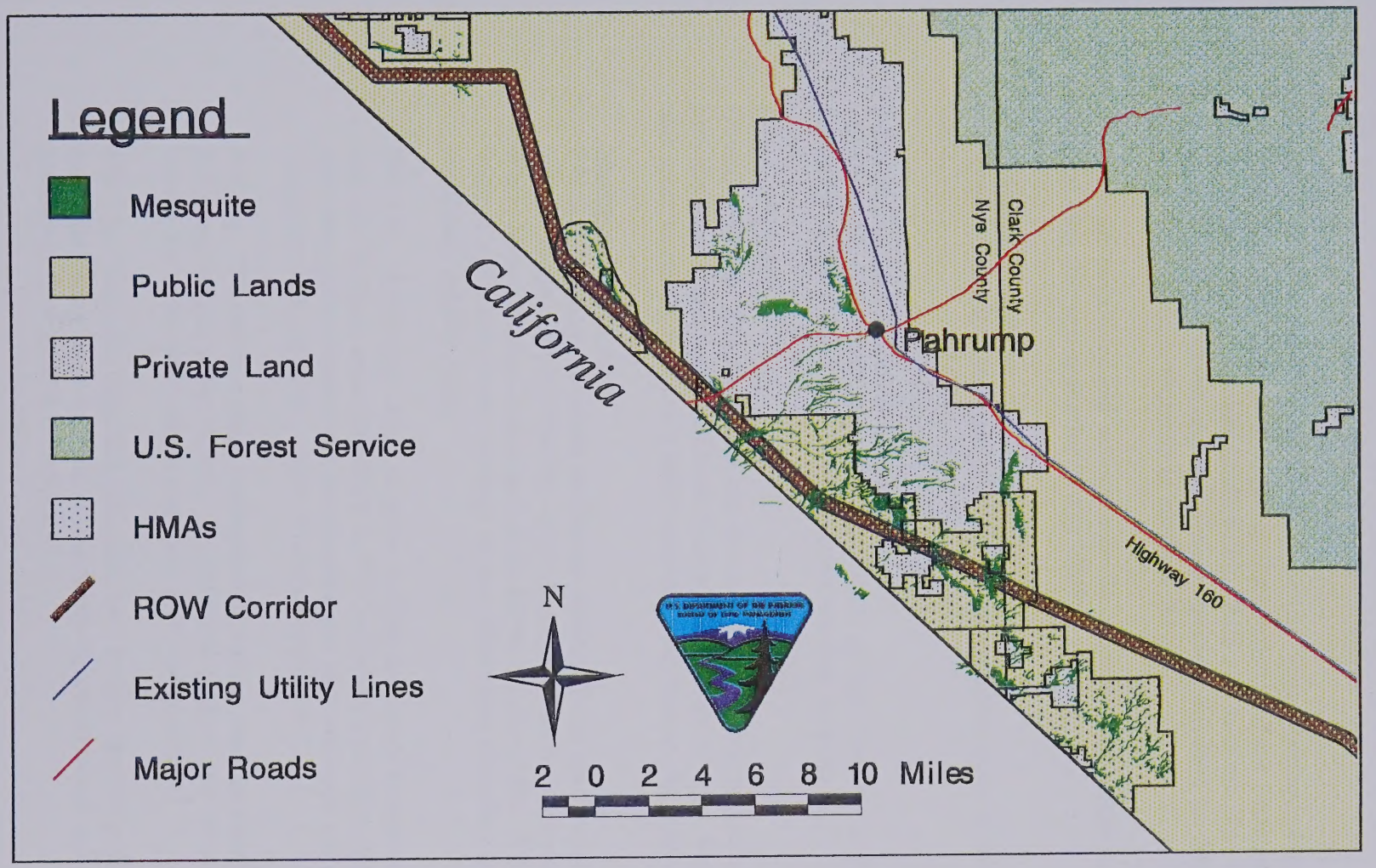

Fig. 1-17. Location of right-of-way corridor in relation to Mesquite Woodland Habitat Management Areas.

2.0 LAND USE PLAN OBJECTIVES AND DECISIONS

Currently, this HMP falls under the direction of the Las Vegas Resource Management Plan. The RMP, approved October 5, 1998, outlines major land use decisions and guides management actions for public lands within Clark and southern Nye Counties. The RMP also provides objectives and specific management direction for Special Status Species and mesquite woodlands in southern Nevada.

Listed below are the objectives and management directions as they appear in the aforementioned Plan that are applicable to this HMP.

Vegetation Management
Objective VG-2: "Restore plant productivity on disturbed areas of the public lands."

Areas of Critical Environmental Concern
Objective AC-2: "Protect areas with significant cultural, natural, or geological values by establishing areas of critical environmental concern ....."

Fish and Wildlife
Objective FW-3: "Support viable and diverse native wildlife populations by providing and maintaining sufficient quality and quantity of food, water, cover, and space to satisfy needs of wildlife species using habitats on public land."

Management Direction
FW-3-a. "Manage mesquite and acacia woodlands for their value as wildlife habitat in the following areas: Amargosa Valley, Meadow Valley Wash, Moapa Valley, Pahrump Valley, Stewart Valley, Hiko Wash, Piute Wash, Crystal and Stump Springs, or any other areas identified as being of significant wildlife value."

FW-3-b. "Allow harvesting of green or dead and down mesquite by permit only and in those areas identified in FW-3-a, where consistent with sustaining plant communities in a healthy and vigorous state and also consistent with sustaining viable wildlife populations."

FW-3-g. "Protect important resting/nesting habitat, such as riparian areas and mesquite/acacia woodlands. Do not allow projects that may adversely impact the water table supporting these plant communities."

FW-3-h. "Improve disturbed non-game bird habitat, including the water table supporting these habitats, by emphasizing maintenance and enhancement of natural biodiversity."

Special Status Species

Objective SS-2. "..... Manage habitats for non-listed special status species to support viable populations so that future listing would not be necessary."

Management Direction

SS-2-a. "Enter into conservation agreements with the U.S. Fish and Wildlife Service and the State of Nevada that, if implemented, could reduce the necessity of future listings of the species in question. Conservation agreements may include, but not be limited to, the following: Blue Diamond cholla, Las Vegas bearpoppy, white-margined penstemon, and Phainopepla."

Forestry Management

Objective FR-1: "Maintain woodland and conifer forest where possible for all-aged stands, with an understory vegetation forage value rating at moderate or better."

Management Direction

FR-1-a. "Firewood cutting and gathering is limited to approved areas subject to restrictions developed for protection of Threatened, Endangered and Sensitive species and other sensitive resources."

FR-1-b. Allow harvest of dead and/or down wood or BLM-marked green mesquite 'trees' for ..... mistletoe control only in approved areas."

3.0 MANAGEMENT OBJECTIVES, ISSUES, AND ACTIONS

These objectives were developed using various planning documents, policies, environmental legislation, and scientific papers, the most widely used of which include the following: Las Vegas RMP, the Endangered Species Act of 1973, as amended, Federal Lands Policy and Management Act of 1976, Clark County Desert Conservation Plan, and BLM's Fish and Wildlife 2000 (Nevada Fish and Wildlife 2000, Nongame Migratory Bird Habitat Conservation Plan, and Rare Plants and Natural Plant Communities). The following objectives, management actions, and recommendations in no way diminish the authority of the State of Nevada to own, control, and manage the State's wildlife or the BLM's mandate to manage habitat on public lands. Those actions that will require amendments to the existing land use plan will be processed as soon as practicable.

3.1 Goals

Manage southern Nevada mesquite woodlands in a manner that will ensure the long-term survival and vigor of woodlands, which will in turn provide important resources needed by the suite of floral and faunal species associated with mesquite woodlands.

Include appropriate levels of monitoring along with the implementation of management actions to evaluate the success of the Plan. Enhance public awareness of the importance of mesquite woodlands as wildlife habitat in the Mojave Desert, and promote respect for the public lands.

3.2 Objectives

The level of disturbance or human use varies widely among the Habitat Management Areas. Also, the size of Habitat Management Areas is extremely variable. In addition, the ability of sites to support Special Status Plant species or relatively large, persistent, and viable Phainopepla populations varies according to site location. Therefore, objectives for this plan will be site-specific.

3.2.1 Moapa

Objective 1. Protect 355 acres of mesquite woodland habitat within the boundary of the Moapa Habitat Management Area.

Objective 2. Manage for a Phainopepla breeding population density of at least 2 breeding pairs per ha, and a nesting success rate of at least 0.5 per year, for the next 30 years[3].

Objective 3. Improve mesquite age class distribution to include at least 20% seedlings and saplings by the year 2008.

Objective 4. Manage to achieve an average of not more than 3 primary stems per tree over the next 30 years.

Objective 5. Maintain groundwater at a static level not to exceed 35 feet in depth over the next 30 years.

3.2.2 Amargosa Flat

Objective 1. Protect 1,930 acres of mesquite woodland habitat within the boundaries of the Amargosa Flat Habitat Management Area.

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[3] Phainopepla populations in southern Nevada are known to fluctuate from year to year depending on the success of the mistletoe berry crop. It is therefore important to monitor overall trends in breeding density and nesting success over many years, and ensure that climatic events contributing to fluctuations in mistletoe berry production are also considered along with trends in Phainopepla nesting success and population density when evaluating the success of management efforts.

Objective 2. Manage to maintain at least 400 acres of dense mesquite (20% of total mesquite habitat) within HMA boundaries over the next 30 years.

Objective 3. Determine current groundwater depth and maintain at a level not to exceed current depth over the next 30 years.

3.2.3 Stewart Valley

Objective 1. Protect habitat for Special Status Plants and 215 acres of mesquite woodland habitat within the boundary of the Stewart Valley Habitat Management Area.

Objective 2. Maintain mesquite tree age class distribution at current levels over the next 30 years (65% mature, 35% seedlings and saplings).

Objective 3. Maintain current average number of stems at 3 per tree, and average percent canopy cover at 70% over the next 30 years.

Objective 4. Protect adjacent areas to maintain or improve habitat for *Eriogonum bifurcatum* and *Phacelia parishii*.

Objective 5. Maintain groundwater at a static level not to exceed 35 feet in depth over the next 30 years.

3.2.4 Pahrump

Objective 1. Maintain or improve habitat for Special Status Plants and 3,385 acres of mesquite woodland habitat within the boundary of the Pahrump Habitat Management Area.

Objective 2. Manage to achieve an average of no more than 3 stems per tree, and percent canopy cover of at least 50%, over the next 30 years.

Objective 3. Maintain mesquite tree age class distribution at 65% mature and 35% seedlings and saplings over the next 30 years.

Objective 4. Protect adjacent areas to maintain or improve habitat for *Eriogonum bifurcatum.*

Objective 5. Maintain groundwater at a static level not to exceed 50 feet in depth over the next 30 years.

3.2.5 Stump Spring

Objective 1. Maintain or improve 1,585 acres of mesquite dune and woodland habitat within the boundary of the Stump Spring Habitat Management Area.

Objective 2. Improve mesquite tree age class distribution along the main wash to include at least 20% seedlings and saplings over the next 30 years.

Objective 3. Manage to achieve an average of no more than 5 stems per tree over the next 30 years.

Objective 4. Maintain groundwater at the main wash at a static level not to exceed 35 feet in depth over the next 30 years.

3.2.6 Other Sites

Objective 1. Protect 130 acres within the Sandy Valley Habitat Management area to maintain or improve habitat for *Eriogonum bifurcatum.*

Objective 2. Protect 1,000 acres of mesquite dunes within the Sandy Valley Habitat Management Area.

Objective 3. Maintain or improve 65 acres of mesquite habitat within the Cactus Springs Habitat Management Area.

Objective 4. Improve mesquite tree age class distribution at Cactus Springs to include at least 20% seedlings and saplings over the next 30 years.

Objective 5. Manage the spring at Cactus Springs to achieve Proper Functioning Condition.

Objective 6. Maintain 270 acres of mesquite habitat within the Dry Lake Habitat Management Area.

3.3 Issues

Following are land-use issues that relate to the above goals and objectives. Each issue is addressed with recommendations or management actions in order to meet the established goals and objectives.

3.3.1 Issue 1: Land-use Designation

Recommendation:

Through an amendment to the RMP, expand the Amargosa ACEC to include all mesquite habitat in the area.

Recommendation:

Through an amendment to the RMP, nominate the Moapa and Stewart Valley Habitat Management Areas as ACECs.

3.3.2 Issue 2: Undesirable Activities in HMAs

Management Action:

Post and maintain No Dumping signs around perimeters of mesquite woodlands.

Management Action:

Organize periodic clean-ups through volunteer programs. See also Issue 13 (Public Awareness).

Management Action:

Increase presence of law enforcement to discourage illegal dumping and other trespass violations. See also Issue 12 (Law Enforcement).

Management Action:

Expedite resolution of trespass violations and illegal occupancy within Habitat Management Areas.

Recommendation:

Work with Nye County and the community of Pahrump to establish a recreational target shooting area outside of mesquite woodlands through an R&PP lease to Nye County or other qualified applicants in the Pahrump area. See also Issue 11 (Recreation).

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

BLM Library
Denver Federal Center
Bldg. 85, OC-521
P.O. Box 25047
Denver, CO 80225

Management Action:

Work with Nye County, the community of Pahrump, and Nevada Division of Wildlife to establish No Shooting zones along the public/private land interface.

Management Action:

Establish a toll-free phone number for the public to report violations and other relevant information useful in the management of the public lands.

3.3.3 Issue 3: Groundwater

Management Action:

Monitor groundwater levels every three months using existing observation wells in Mesquite HMAs.

Recommendation:

Drill additional observation wells over time, as needed.

Recommendation:

Investigate the feasibility of obtaining a guaranteed minimum groundwater level sufficient to maintain existing mesquite stands. Work with the State Water Engineer to develop standards for acceptable aquifer drawdown levels.

Management Action:

Through the NEPA process, analyze the impacts to groundwater and mesquite woodlands for all federal actions occurring on the public lands (e.g. golf courses).

Recommendation:

Install gabions or other appropriate flood control structures in the wash at Stump Spring to alleviate and reverse severe erosion occurring at this site.

Management Action:

Develop a public educational program to enhance understanding of the importance of groundwater conservation. See also Issue 13 (Public Awareness).

3.3.4 Issue 4: Woodcutting

Management Action:

Permits will be required for the harvest of any mesquite wood, and will be issued only for those circumstances that are consistent with promoting the health of mesquite woodlands (e.g. fuel load reduction).

Management Action:

Post and maintain No Woodcutting signs around perimeter of mesquite woodlands.

Management Action:

Control vehicular access into mesquite woodlands via fencing and/or road closures.

Management Action:

Increase law enforcement presence in Habitat Management Areas to discourage the illegal harvest of mesquite wood. See also Issue 12 (Law Enforcement).

Management Action:

Coordinate with the Nevada Division of Wildlife and other appropriate agencies or entities to establish a Phainopepla monitoring program at the Moapa Habitat Management Area. Also conduct periodic surveys at other Mesquite HMAs to collect current data on the status of Phainopepla in southern Nevada.

3.3.5 Issue 5: Herbivory

Management Action:

If horse and burro use of the Cactus Springs area becomes a problem, take appropriate action to protect the spring and mesquite seedlings from trampling and herbivory.

Management Action:

Remove remaining horses from the Amargosa Flat Habitat Management Area per current management level for zero animals in the Ash Meadows Herd Management Area.

Management Action:

Periodically monitor the spring in the Amargosa Flat Habitat Management Area and take protective actions if needed.

Recommendation:

With the assistance of research institutions, determine the cause(s) of low mesquite seedling recruitment at Moapa and Stump Spring HMAs.

Recommendation:

Investigate the feasibility of periodic lagomorph and rodent population reduction by Animal Damage Control at the Moapa Habitat Management Area if studies determine that these animals are impacting seedling recruitment.

Management Action:

Monitor the Stump Spring and Moapa Habitat Management Areas for germination events and protect seedlings from herbivory by either construction of exclosure plots or placement of protective cages around seedlings. If necessary, plant seedlings to re-establish desireable age classes, while ensuring genetic integrity of the mesquite community.

Management Action:

Ensure that no livestock grazing remains in effect for all Mesquite Habitat Management Areas.

3.3.6 Issue 6: Wildfire

Management Action:

Implement the Fire Management Plan which designates mesquite woodland areas as a Zone A fire suppression zone.

Management Action:

Reduce fuel loads in mesquite woodlands by removing slash build-up caused by previous woodcutting and illegal dumping of yard cuttings and Christmas trees.

Management Action:

Create fire breaks within the private/public land interface, and work with Nye County public works to reduce vegetation along roadsides that run along private/public land boundaries.

Management Action:

GPS all roads in and around mesquite woodlands. Devise a naming or numbering system for roads to be marked and produce maps to be distributed to local and area fire stations, search and rescue, and sheriff's departments to assist in quick response to fire outbreaks.

Management Action:

Work with local fire officials to establish criteria for allowing open fires in the vicinity of mesquite woodlands. See also under Issue 11 (Recreation).

3.3.7 Issue 7: Invasive Exotic Plants

Management Action:

Eradicate and/or control invading saltcedar at Pahrump and Stump Spring HMAs.

Management Action:

Eradicate patches of Russian knapweed and star thistle that have established in the Pahrump HMA.

3.3.8 Issue 8: Minerals

Recommendation:

Through an amendment to the RMP, withdraw Mesquite Woodland Habitat Management Areas from mineral entry.

Management Action:

In areas where mining is allowed in Habitat Management Areas, work to mitigate impacts to mesquite during the mining plan approval process.

Management Action:

During Notice level activity, work with the proponent to minimize impacts to mesquite.

Management Action:

Do not authorize mineral sales in Mesquite Woodland Habitat Management Areas.

3.3.9 Issue 9: Lands and Realty Actions

Recommendation:

Ensure that all land disposals as described in the Las Vegas RMP are consistent with the objectives of this Habitat Management Plan, and do not result in the net loss of mesquite woodlands or habitat for Special Status Plants within the boundaries of the Habitat Management Areas.

Recommendation:

Retain all public lands that contain mesquite woodlands and Special Status Plants in federal ownership.

Management Action:

Mitigate impacts within right-of-way corridors during construction and maintenance of utility lines to minimize destruction or disturbance to mesquite woodlands and Special Status Plants. This includes off-site mitigation, avoidance, restoration, minimizing clearance of vegetation within rights-of-way, selective pole/tower placement to avoid mesquite, and other measures as appropriate.

Recommendation:

Through an amendment to the RMP, designate an alternative utility corridor route that avoids mesquite woodlands and Special Status Plants.

Management Action:

Discourage the construction of new roads and require restoration of temporary roads to pre-existing conditions.

Management Action:

Do not allow lands actions that would affect groundwater levels in Mesquite Woodland Habitat Management Areas.

3.3.10 Issue 10: Wilderness Areas

Management Action:

Coordinate with the BLM, Ridgecrest District, in California to control vehicular access to existing wilderness areas by roads leading to wilderness areas from the adjoining Mesquite HMAs along the Nevada-California state line.

3.3.11 Issue 11: Recreation

Management Action:

Do not allow OHV speed events within 1/4 mile of mesquite woodlands during the Phainopepla breeding season (February through May).

Management Action:

Ensure that activities permitted by BLM during the Phainopepla breeding season do not have a negative impact on Phainopepla breeding success.

Management Action:

Document, with the use of GPS, existing roads and trails in all Habitat Management Areas by the end of FY99 to establish a baseline for existing roads and trails.

Management Action:

Change OHV designations in Habitat Management Areas to designated roads and trails through any action necessary to do so (e.g. amendment to the RMP or through an interim closure). Roads that are designated closed will be restored.

Management Action:

Work with Nye County and the community of Pahrump to establish alternative areas away from mesquite stands for recreational target shooting. Work with local fire officials to establish criteria for open fires in the vicinity of mesquite woodlands to reduce the threat of wildfire. See also Issue 2 (Undesireable Activities) and Issue 6 (Wildfire).

Management Action:

Consider the feasibility of designating camping areas within mesquite Habitat Management Areas to concentrate activity in previously disturbed sites and away from mesquite trees.

Management Action:

Work with Nevada Division of Wildlife and Nye County to establish No Hunting zones at the urban/public land interface in Mesquite Woodland Habitat Management Areas.

Recommendation:

Implement a study investigating the effect of soil compaction on mesquite tree physiology (including water uptake), germination, and seedling establishment.

3.3.12 Issue 12: Law Enforcement

Management Action:

Include Mesquite Woodland Habitat Management Areas as high priority areas in patrol plans.

Management Action:

Ensure adequate law enforcement presence in Mesquite Woodland Habitat Management Areas, and concentrate efforts in those areas close to urban centers (e.g. Pahrump and Moapa HMAs).

Management Action:

Enter into a Memorandum of Understanding with the BLM Ridgecrest District in California to more efficiently deal with law enforcement issues in areas along the Nevada-California state line.

3.3.13 Issue 13: Public Awareness

Management Action:

Construct interpretive signs where appropriate to educate the public on the importance of mesquite woodlands in southern Nevada.

Management Action:

Develop a brochure or video on avian use of mesquite habitats in the Mojave Desert.

Management Action:

Develop a Bird Check-list for avian species that occur in southern Nevada mesquite woodlands.

Management Action:

Work through the Clark County Multiple Species Habitat Conservation Plan to increase public awareness of the ecological significance of mesquite woodlands in the Mojave Desert.

Management Action:

Work with civic groups to organize periodic clean-ups and patrols in Habitat Management Areas. See also Issue 2 (Undesireable Activities).

Management Actions:

Develop a slide show for presentations to civic groups that will educate the public on the importance of mesquite woodlands in the Mojave Desert and their use by wildlife species.

Management Action:

Develop a Web Page under the Nevada BLM Web site describing mesquite woodland conservation efforts in Nevada, including maps of the areas, lists and images of associated flora and fauna, and links to other interesting sites associated with mesquite research and conservation.

3.4 Recommendations for RMP Amendments

The Mesquite Woodland Habitat Management Plan was developed after finalization of the BLM Las Vegas Resource Management Plan. As a result, many recommendations for management of mesquite woodlands in Habitat Management Areas are not specifically identified in the RMP, although they conform to the objectives described in the RMP. This HMP recommends amending the Las Vegas RMP to include those management actions not addressed in the RMP. Table 3-1 lists recommendations for amendments to the RMP proposed in Section 3.3 (Issues).

Table 3-1. Recommendations for amendments to the Las Vegas Resource Management Plan for mesquite woodland Habitat Management Areas in southern Nevada.

HMP Section No.	Issue	Recommendation
3.3.1	Land-use Designation	Nominate the Moapa and Stewart Valley HMAs as ACECs
3.3.1	Land-use Designation	Expand the Amargosa ACEC to include all mesquite habitat in the area
3.3.8	Minerals	Withdraw Mesquite Woodland HMAs from mineral entry
3.3.9	Lands and Realty Actions	Adjust the RMP land disposal area boundaries to exclude Mesquite Woodland HMAs and habitat for Special Status Plants
3.3.9	Lands and Realty Actions	Designate an alternative utility corridor route that avoids mesquite woodlands and Special Status Plants
3.3.11	Recreation	Change OHV designations in Mesquite Woodland HMAs to designated roads and trails

This Habitat Management Plan recommends the nomination of the Moapa and Stewart Valley HMAs as ACECs because of certain qualities or values that set them apart from the other HMAs. The Moapa HMA is unique in that it currently has the potential to support a relatively dense Phainopepla breeding population. The Stewart Valley HMA is unique because this vegetation community is one of the only remaining mesquite woodlands in southern Nevada that is in relatively pristine condition, and includes two Special Status plant species that are closely associated with the mesquite habitat. Table 3-2 lists resource constraints proposed for these ACECs.

Table 3-2. Proposed ACEC nominations and associated resource constraints. These are only proposals to be considered, and will be required to go through the land use planning process which in turn requires a separate input process and formal public review.

ACEC Name		Moapa	Stewart Valley
Acreage		1,120	4,940
Values		Special Status Species	Special Status Species, Unique Plant Community
Resource Constraints	Lands	Retain in federal ownership. Designate as ROW avoidance area except within currently established corridors.	Retain in federal ownership. Designate as ROW avoidance area.
	Minerals	Close to locatable minerals, salables and solid leasables. Open to fluid minerals subject to no surface occupancy stipulations. Close to mineral material ROWs.	
	Range	N/A	N/A
	Roads	Require reclamation of temporary roads. Authorize new roads in response to specific authorized actions only, ensure access to private property.	
	Wildlife/Forestry	Do not allow commercial collection of flora. Do not allow woodcutting or collecting, except for purposes of improving the resource (e.g. slash reduction).	
	OHV/ORV Designation and Recreation	Designate as "Limited to designated roads and trails" for all motorized and mechanized vehicles. Prohibit ORV speed events. Allow other events on a case-by-case basis. Do not allow campfires. Do not allow recreational target shooting.	

4.0 COORDINATION

4.1 Other BLM Programs

4.1.1 Livestock

All grazing allotments intersecting with Mesquite Woodland Habitat Management Areas have been closed. Therefore, livestock grazing is not an issue for any of the Mesquite Woodland Habitat Management Areas.

4.1.2 Wild Horses and Burros

The Ash Meadows and Johnnie Herd Management Areas intersect with the Amargosa Flat Mesquite HMA. The Appropriate Management Level for this area has been set at zero. Although most horses and burros have been removed from the Ash Meadows Herd Management Area, a small herd of 8-9 horses remains in the mesquite woodland. Cooperation with the Wild Horse and Burro program will be needed to monitor wild horse activity within the mesquite stand, and to remove the remaining horses from the area.

4.1.3 Forest and Woodland Products and Desert Vegetation

Mesquite is a popular resource used for firewood, barbeque grilling, and wood carvings because the wood is hard and dense, and burns long and hot. Unauthorized cutting of mesquite trees continues to be a problem in southern Nevada. To achieve HMP and RMP objectives for permitted wood harvest only, coordination with law enforcement rangers will be needed.

4.1.4 Lands

Approximately 740 acres of mesquite woodlands occupy public lands identified for disposal through the RMP; 35 acres at Moapa and 705 acres at Pahrump. In addition, major existing rights-of-way and ROW corridors bisect several Mesquite HMAs. This plan proposes to recommend only those lands actions in and adjacent to Mesquite HMAs that will not alter groundwater level or cause loss or damage to existing woodlands or habitat for Special Status Plants. Disposal areas identify those lands potentially available for disposal. If unacceptable negative impacts to wildlife, Special Status Species, or vegetation are identified during the NEPA or scoping process, the proposed action should be denied. These actions will require close coordination with the BLM Lands staff.

4.1.5 Soil, Water, and Air Resources

Groundwater hydrology is an important issue in the conservation of mesquite woodlands in southern Nevada. Consultation with soil scientists and hydrologists will be needed to obtain data or information necessary for proper management decisions.

4.1.6 Recreation

Both casual and permitted recreational activities occur in the Mesquite HMAs. This plan recommends management of recreational activities in Mesquite HMAs to reduce or eliminate disturbance or destruction of mesquite woodlands and habitat for Special Status Species. If recreational use becomes a problem, it may be necessary to develop a recreational management plan for these areas. Cooperation with the Recreation Program will be essential to implement management actions that will achieve the objectives of this plan.

4.1.7 Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 requires that Federal agencies take into account the effects of their undertakings on historic properties. Efforts to identify and evaluate cultural resource properties, and consult with the Nevada State Historic Preservation Office will be conducted prior to initiating any project involving surface disturbance within Mesquite HMAs.

4.1.8 Energy and Minerals

Currently, mining activity in or adjacent to Mesquite HMAs is limited, with the most significant activity occurring in the vicinity of the Amargosa Flat HMA. Close coordination with the Minerals Program will be needed to keep current with the status of mining claims, Notices, and Plans of Operation associated with the clay pit that occupies the playa west of the Amargosa Flat mesquite woodland. This plan also recommends prohibition of mineral sales within Mesquite HMAs, and calls for mitigative measures in those areas where mining is allowed. These actions also require cooperation with the Minerals Program to ensure projects minimize or eliminate impacts to mesquite woodlands.

4.1.9 Fire Management

Increased incidence of wildfire, originating from natural, accidental, or intentional sources, threatens to destroy woodlands in southern Nevada faster than they can be replaced. Increased fuel loads from build-up of slash left behind by woodcutters increases the chance of high-intensity fires that kill trees and sterilize soils. Coordination with the Fire Management Program will be ongoing to ensure quick

response to fires, to reduce fuel loads, and to create fire breaks along the private/public land interface.

4.1.10 Support Actions

The support of law enforcement rangers is essential to control illicit activities in mesquite woodlands. The assistance of BLM's Operations division will also be needed to restore roads and habitat, install interpretive signs, and construct fences where appropriate. The Public Affairs Officer will also be consulted for the development of public outreach programs, media news releases, and educational material.

4.2 Other Agencies and Organizations

4.2.1 Federal Agencies

Wild horses and burros in the Wheeler Pass Herd Management Area are managed by the Forest Service. The Cactus Springs Mesquite Woodland HMA lies within the boundaries of the Wheeler Pass Herd Management Area. If horse and burro use of the Cactus Springs area becomes a problem, coordination with the Forest Service will ensure that actions are implemented to protect mesquite habitat in this area.

The BLM, Ridgecrest District in California manages the public lands and wilderness areas adjoining Stewart, Pahrump, and Mesquite Valleys. Coordination with Ridgecrest District law enforcement officers will increase the effectiveness of management efforts for Mesquite HMAs located along the California-Nevada state line.

4.2.2 State, County, and Local Agencies

4.2.2.1 Nevada Division of Wildlife

The BLM Las Vegas Field Office will coordinate with the Nevada Division Of Wildlife for monitoring of Phainopepla populations in Moapa, surveys in other HMAs, road designations, and proposals for hunting restrictions within the private/public land interface.

4.2.2.2 Nevada Division of Forestry

The Nevada Division of Forestry and State Nursery may be consulted for projects that include propagation, restoration, or rehabilitation of mesquite habitat.

4.2.2.3 Nevada State Water Engineer's Office

Consultation with the State Water Engineer and local government entities will be needed to resolve potential future water use conflicts within the mesquite Habitat Management Areas.

4.2.2.4 Nevada Natural Heritage Program

Data aquired from Phainopepla surveys will be shared with the Nevada Natural Heritage Program, and will in turn be consulted for information on other species occurrences within Mesquite Woodland HMAs.

4.2.2.5 University of Nevada

Consultation with UNLV and UNR research scientists may be needed for specific research or information needs related to mesquite habitat conservation and enhancement, which may include more precise soil moisture measurements and studies on the effect of soil compaction on groundwater level and mesquite physiology as related to water uptake. Other in-state or out-of-state academic institutions familiar with mesquite research may also be consulted.

4.2.2.6 Local and County Agencies

Mesquite Woodland HMAs are distributed throughout Clark and southern Nye Counties, and include areas adjacent to the communities of Glendale, Sandy Valley, Crystal, and Pahrump. Private and patented lands also occur in the vicinity of the Amargosa Flat, Stump Spring, and Cactus Springs HMAs. Proposed actions that will conserve and enhance mesquite woodland habitat may be partially funded through Clark County's Multiple Species Habitat Conservation Plan. Nye County is also developing a Habitat Conservation Plan, and close coordination with Nye County representatives will facilitate a more efficient process of plan development and implementation that will complement the proposed actions of this HMP. Specific actions will be coordinated with the Clark County HCP Implementation and Monitoring Committee.

4.2.3 Non-governmental Organizations and Private Groups

The Nature Conservancy is a reviewer of this plan, and will be consulted for input on proposed actions during the development of this HMP. The Audubon Society will be a valuable resource for the development of a bird check-list for mesquite woodlands in southern Nevada. A variety of recreation user groups, including OHV groups, hunters, and recreational shooting groups, will be contacted when road designation and shooting restriction evaluations are conducted.

5.0 IMPLEMENTATION SCHEDULE

The implementation schedule below has been developed through fiscal year 2003 (Table 5-1). The project activities and agency responsibilities are identified, as well as the units of completion by reporting year. The schedule is dependent upon sufficient funding and availability of personnel. Thus, this schedule is subject to change.

Table 5-1. Project activity implementation for fiscal years 1999 through 2003.

Planned Actions	Agency	FY99	FY00	FY01	FY02	FY03
Monitor Phainopepla population density and breeding success at Moapa HMA	BLM/Nevada Division of Wildlife	X		X		X
Finish GPSing roads and produce GIS maps of roads in Pahrump HMA	BLM	X				
GPS roads in remaining HMAs	BLM		X			
Post and maintain "No Wood-cutting" and "No Dumping" signs at all 8 HMAs	BLM	X		X		X
Law Enforcement	BLM	X	X	X	X	X
Designation of roads and trails in Pahrump HMA	BLM		X			
Fencing at Pahrump HMA (materials and labor)	BLM/outside contractors		X	X	X	X
Establish and implement groundwater monitoring plan at Stewart Valley, Pahrump, Stump Spring, and Moapa HMAs	BLM	X	X	X	X	X
Restore 2 acres at Pahrump HMA dump clean-up sites	BLM	X				
Major dumpsite clean-up at Pahrump HMA	BLM/outside contractors	X		X		
Knapweed eradication at Pahrump HMA	BLM	X				
Saltcedar eradication at Stump Spring and Pahrump HMAs	BLM/Southern Nevada Restoration Team			X	X	X
Develop legal descriptions, calculate exact acreage, and create/produce GIS maps of areas within HMAs to be included in the land withdrawal petition/application	BLM	X				
Develop and implement monitoring plan for mesquite seedling establishment, growth, and survival at Moapa HMA	BLM/Nevada Division of Forestry	X	X	X	X	X
Develop Public Information and Education materials	BLM			X	X	
Develop and maintain Web Page	BLM		X	X	X	X
Install gabions at Stump Spring HMA	BLM		X		X	
Fence spring at Amargosa Flat HMA (if needed)	BLM			X		

6.0 COST SCHEDULE AND BENEFIT/COST ANALYSIS

6.1 Cost Schedule

The itemized costs for fulfilling and maintaining this HMP have been estimated through fiscal year 2003 (Table 6-1). The costs are separated by activity for each fiscal year. Project survey and design and National Environmental Policy Act compliance costs are included for all projects.

Table 6-1. Costs ($s in thousands) of implementing the Habitat Management Plan for fiscal years 1999 through 2003.

Planned Actions	FY99	FY00	FY01	FY02	FY03	Total
Monitor Phainopepla population density and breeding success at Moapa HMA	5		5		5	15
Finish GPSing roads and produce GIS maps of roads in Pahrump HMA	4					4
GPS roads in remaining HMAs		5				5
Post and maintain "No Wood-cutting" and "No Dumping" signs at all 8 HMAs	5		2		2	9
Law Enforcement	20	40	40	40	40	180
Designation of roads and trails in Pahrump HMA		10				10
Fencing at Pahrump HMA (materials and labor)		10				10
Establish and implement groundwater monitoring plan at Stewart Valley, Pahrump, Stump Spring, and Moapa HMAs	1	1	1	1	1	5
Restore 2 acres at Pahrump HMA dump cleanup sites	5					5
Major dumpsite cleanup at Pahrump	15		25			40
Knapweed eradication at Pahrump HMA		1			1	2
Saltcedar eradication at Stump Spring and Pahrump		7	7	7	7	28
Determine legal descriptions, calculate exact acreage, and create/produce GIS maps of areas within HMAs to be included in the land withdrawal petition/application	3					3
Develop and implement monitoring plan for mesquite seedling establishment, growth, and survival at Moapa HMA	5	15	2	2	2	26
Develop Public Information and Education materials			10	5	5	20
Develop and maintain Web Page		3	3	1	1	8
Install gabions at Stump Spring		15	10	10	10	45
Fence spring at Amargosa Flat HMA (if needed)			5			5
Total	63	107	110	66	74	420

6.2 Benefit/Cost Analysis

A comparison of benefit versus cost will not be analyzed because it is not possible to assign a monetary value on the benefit of maintaining biological diversity and protecting threatened, endangered, or sensitive species and rare plant communities. However, implementation of conservation measures that would prevent federal listing of a species is less expensive than attempting to manage for a species once it has been listed.

7.0 CONCURRENCE AND APPROVAL

This HMP as written meets with our concurrence and approval.

Prepared by:

_____ _____

Jeri K. Krueger, Wildlife Biologist Date

Approved by:

_____ _____

Mike Dwyer, District Manager Date
Las Vegas Field Office

APPENDICES

APPENDICES

Appendix I.

Location maps of Mesquite Woodland
Habitat Management Areas

1A. Moapa

1B. Amargosa Flat

1C. Stewart Valley

1D. Pahrump

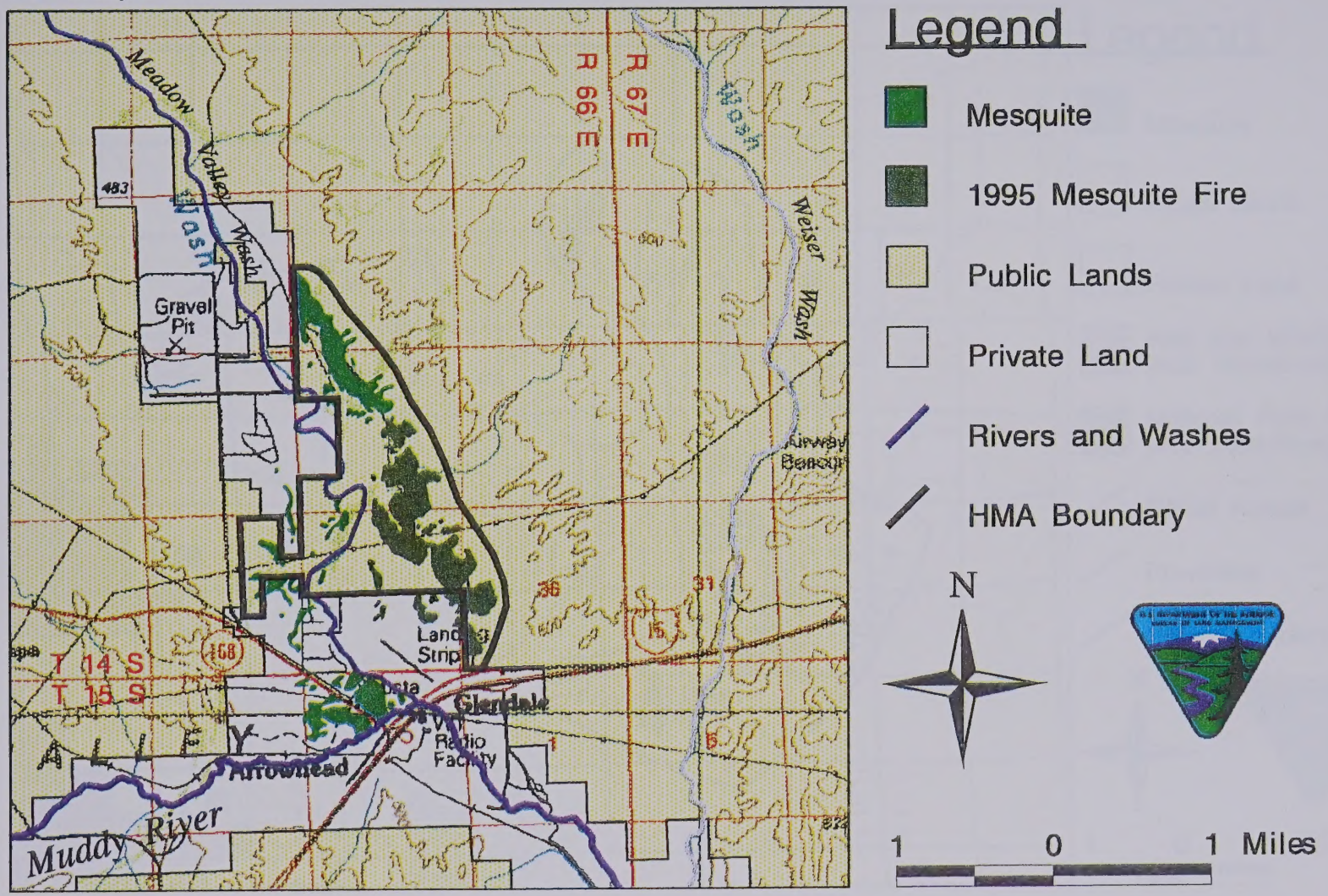
1E. Stump Spring

1F. Dry Lake

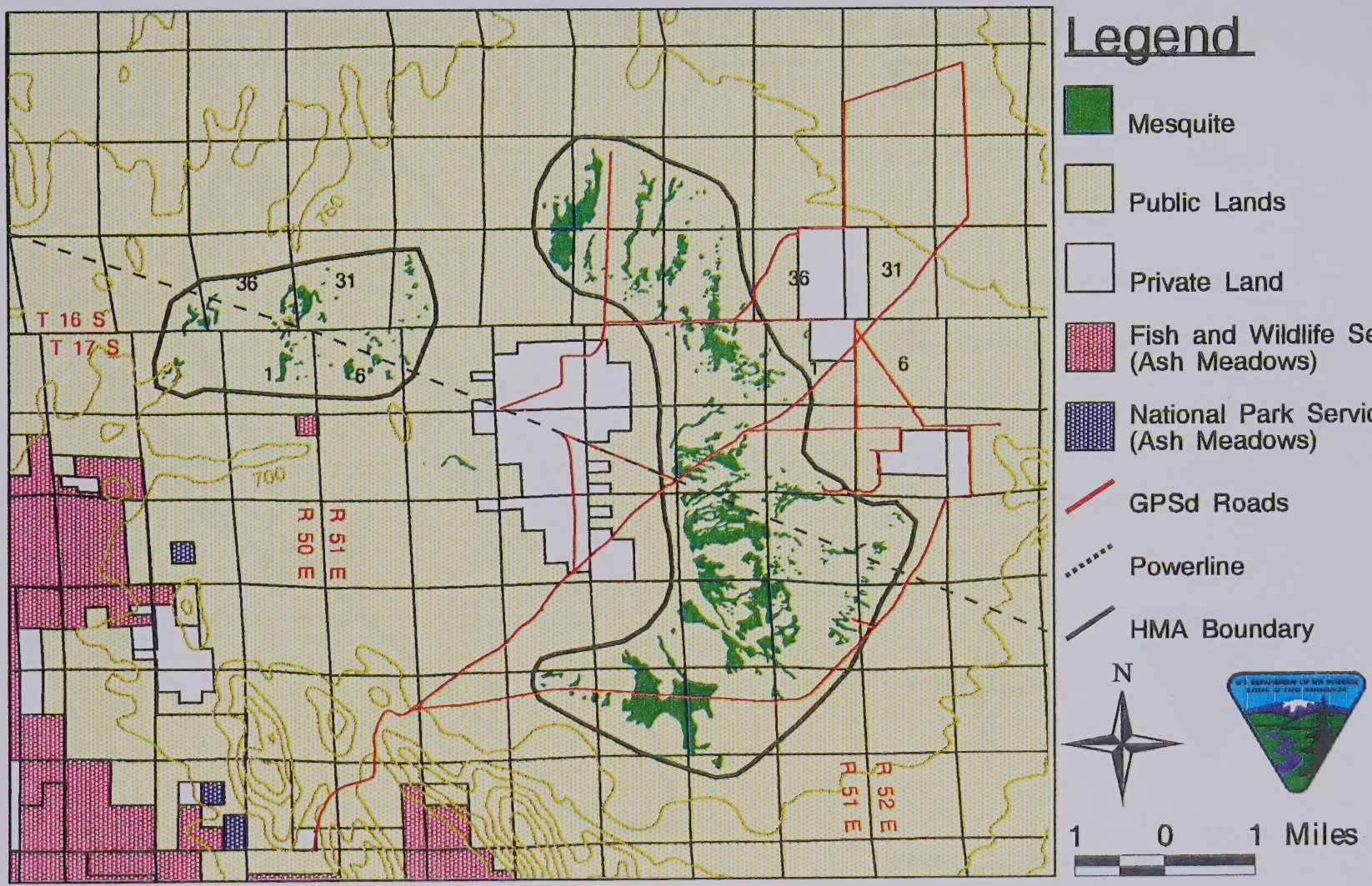
1G. Cactus Springs

1H. Sandy Valley

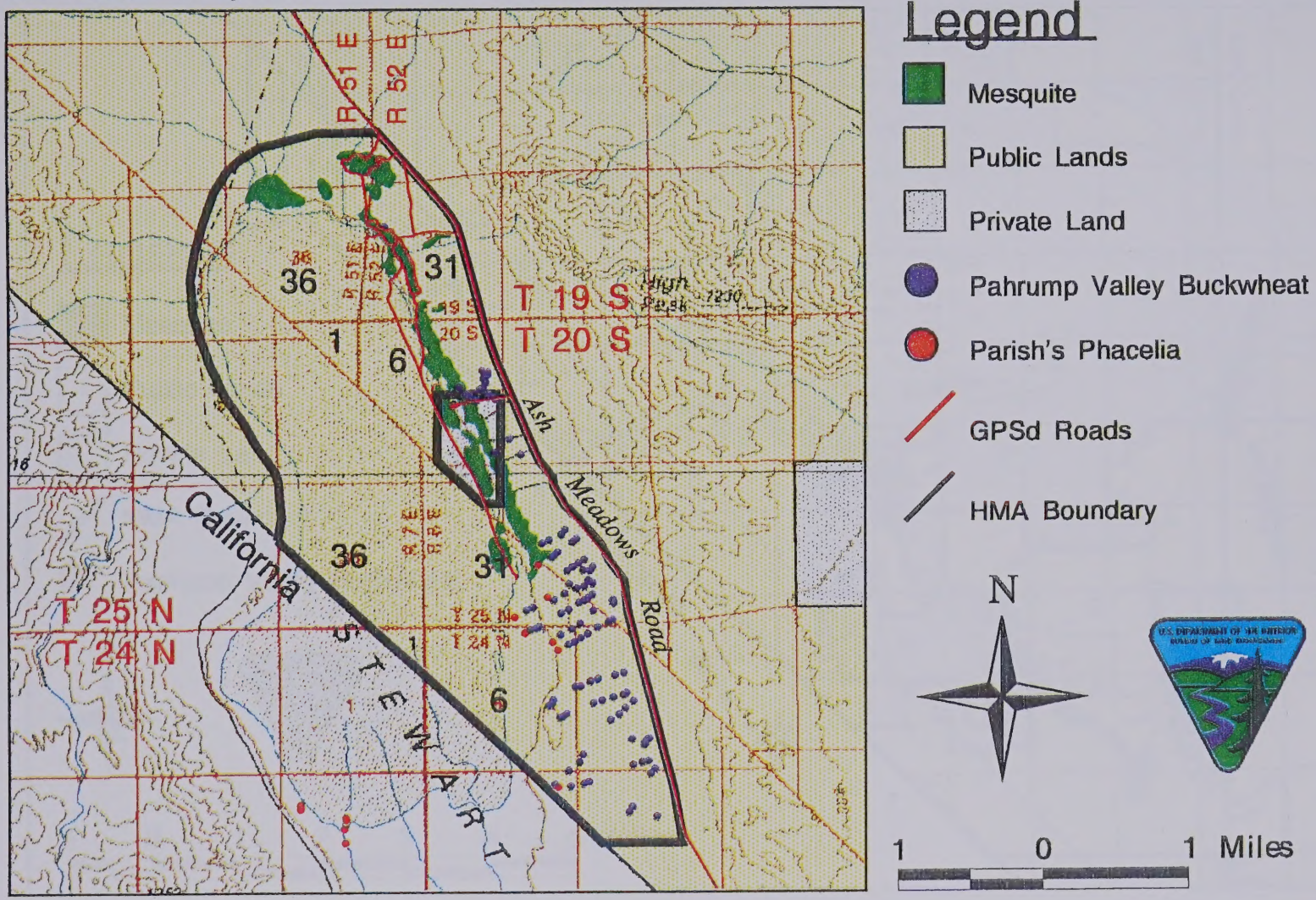
IA. Moapa HMA


Meadow Valley Wash
Wash
Gravel Pit
483
R 66 E
R 67 E
Wash
Weiser Wash
Airway Beacon
36
31
15
168
T 14 S
T 15 S
Landing Strip
Glendale
Radio Facility
Arrowhead
Muddy River
Legend
Mesquite
1995 Mesquite Fire
Public Lands
Private Land
Rivers and Washes
HMA Boundary
N
1
0
1 Miles

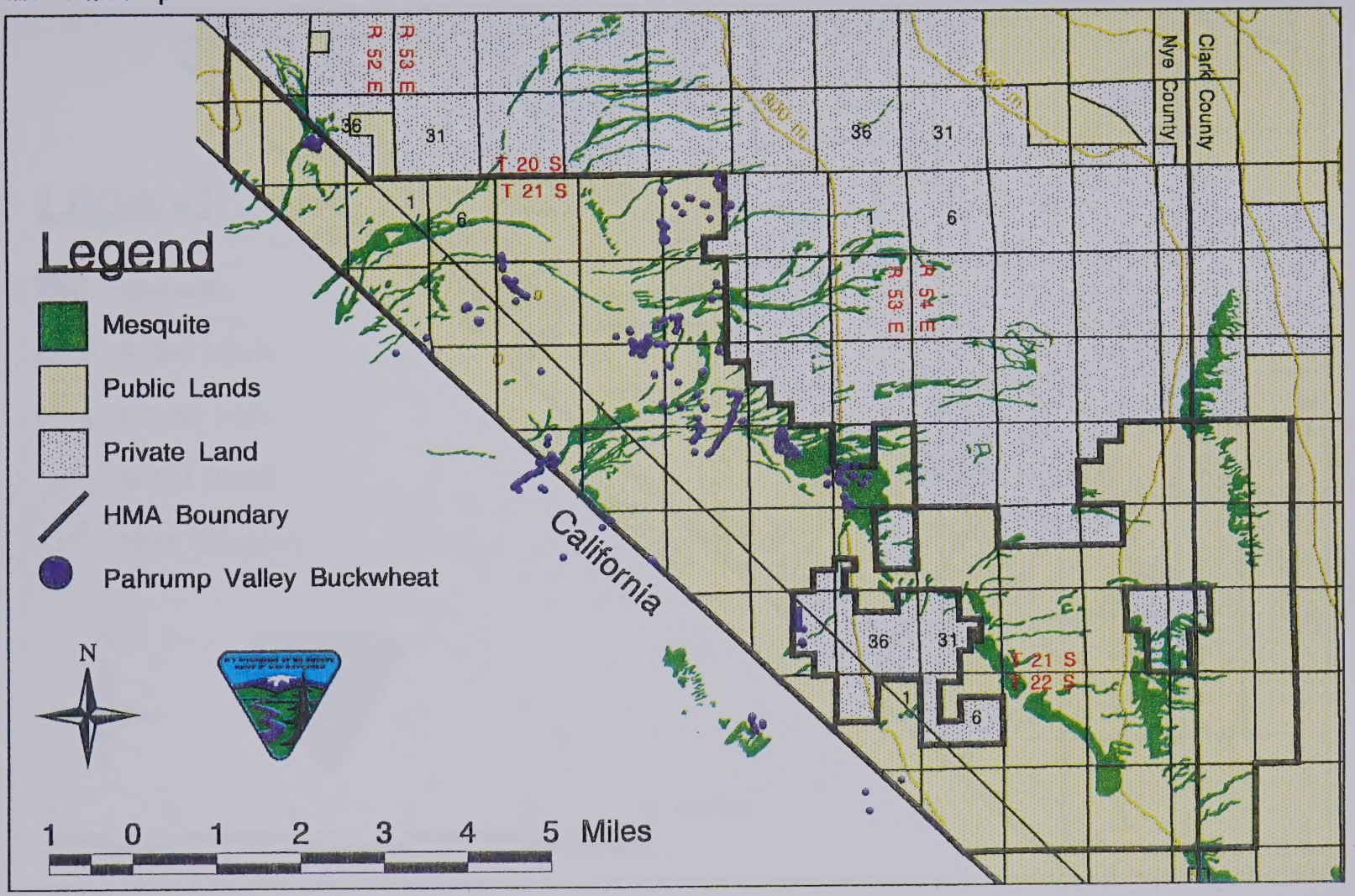
IB. Amargosa Flat HMA



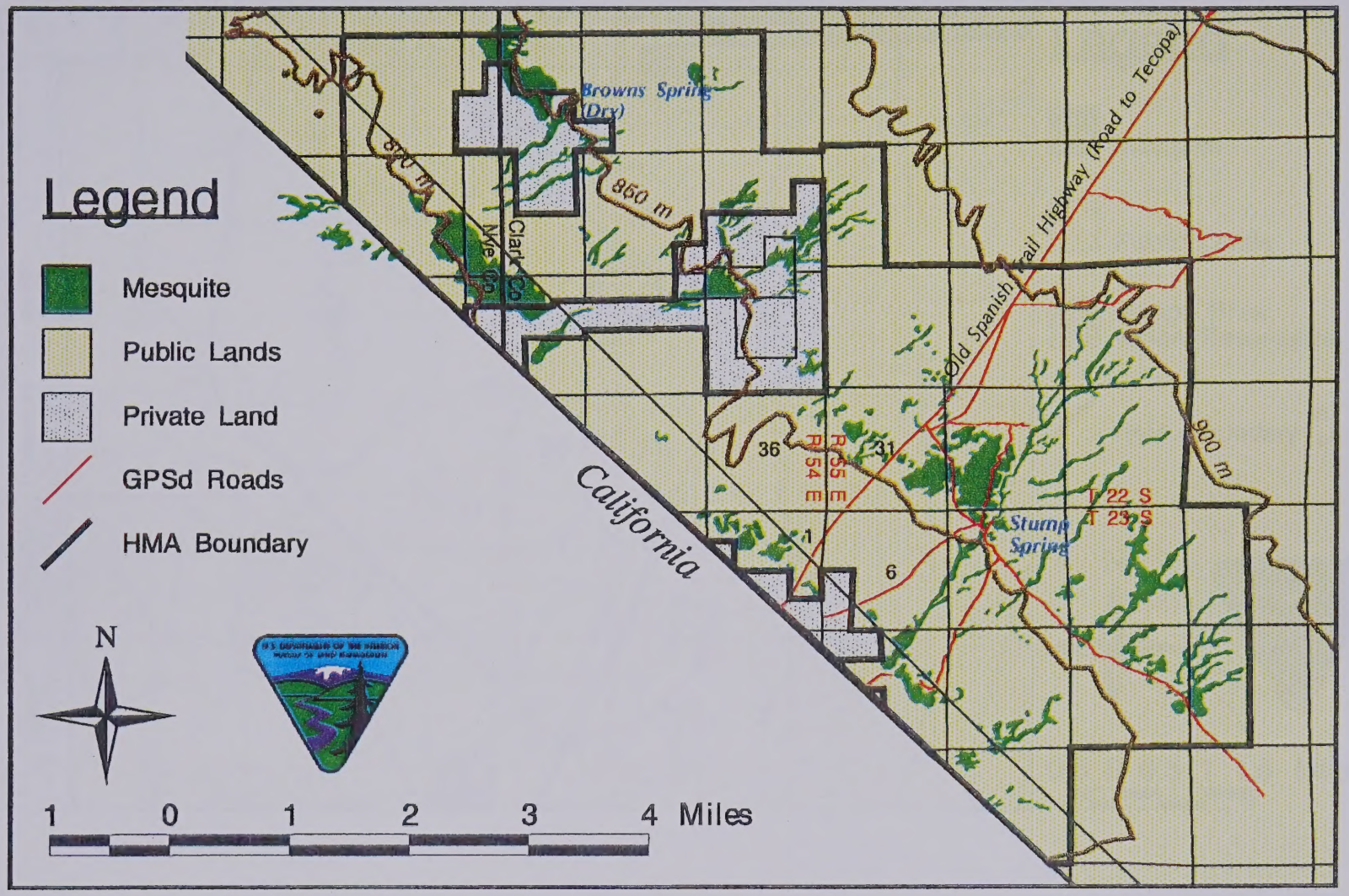
IC. Stewart Valley HMA



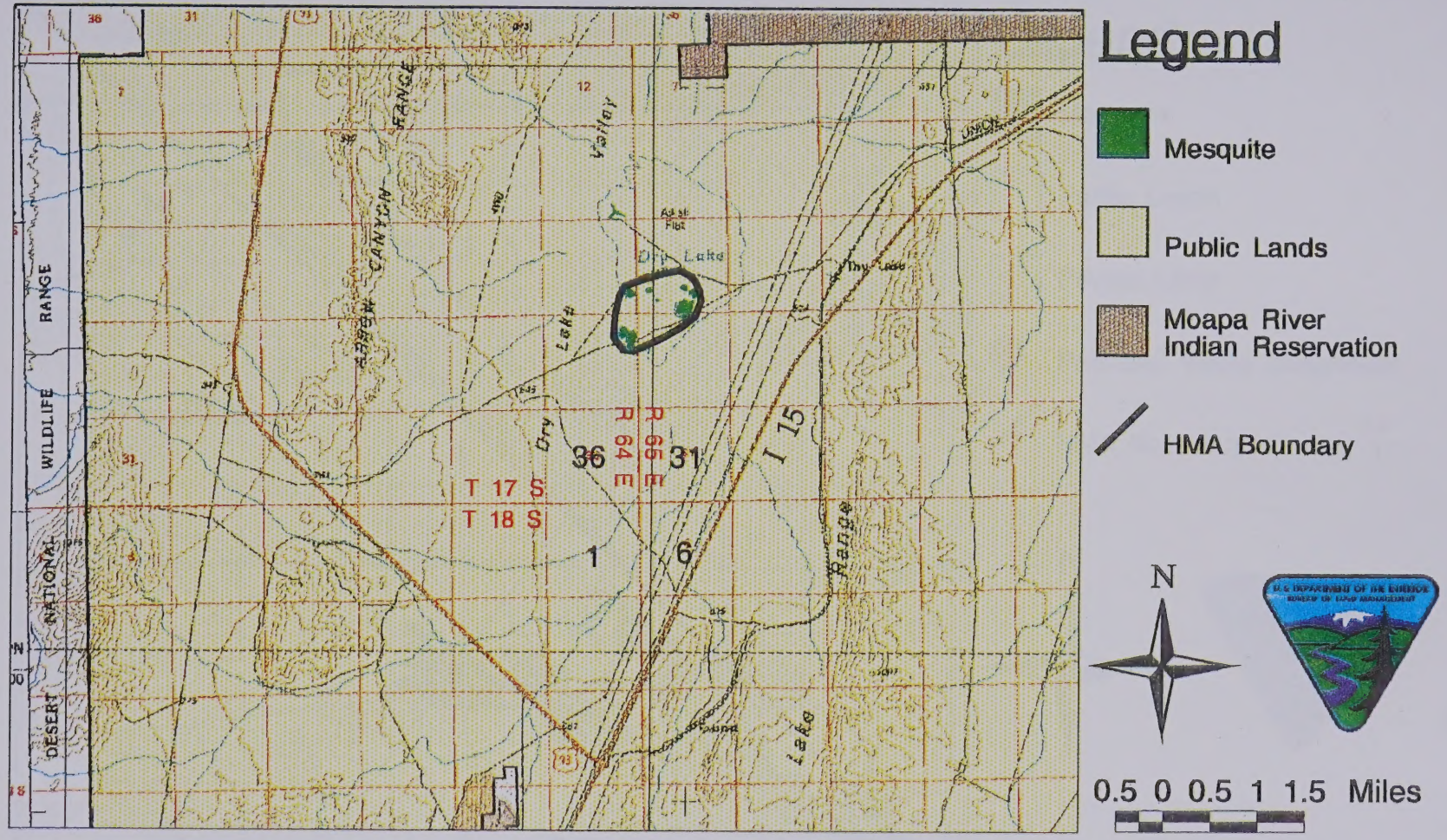
ID. Pahrump HMA



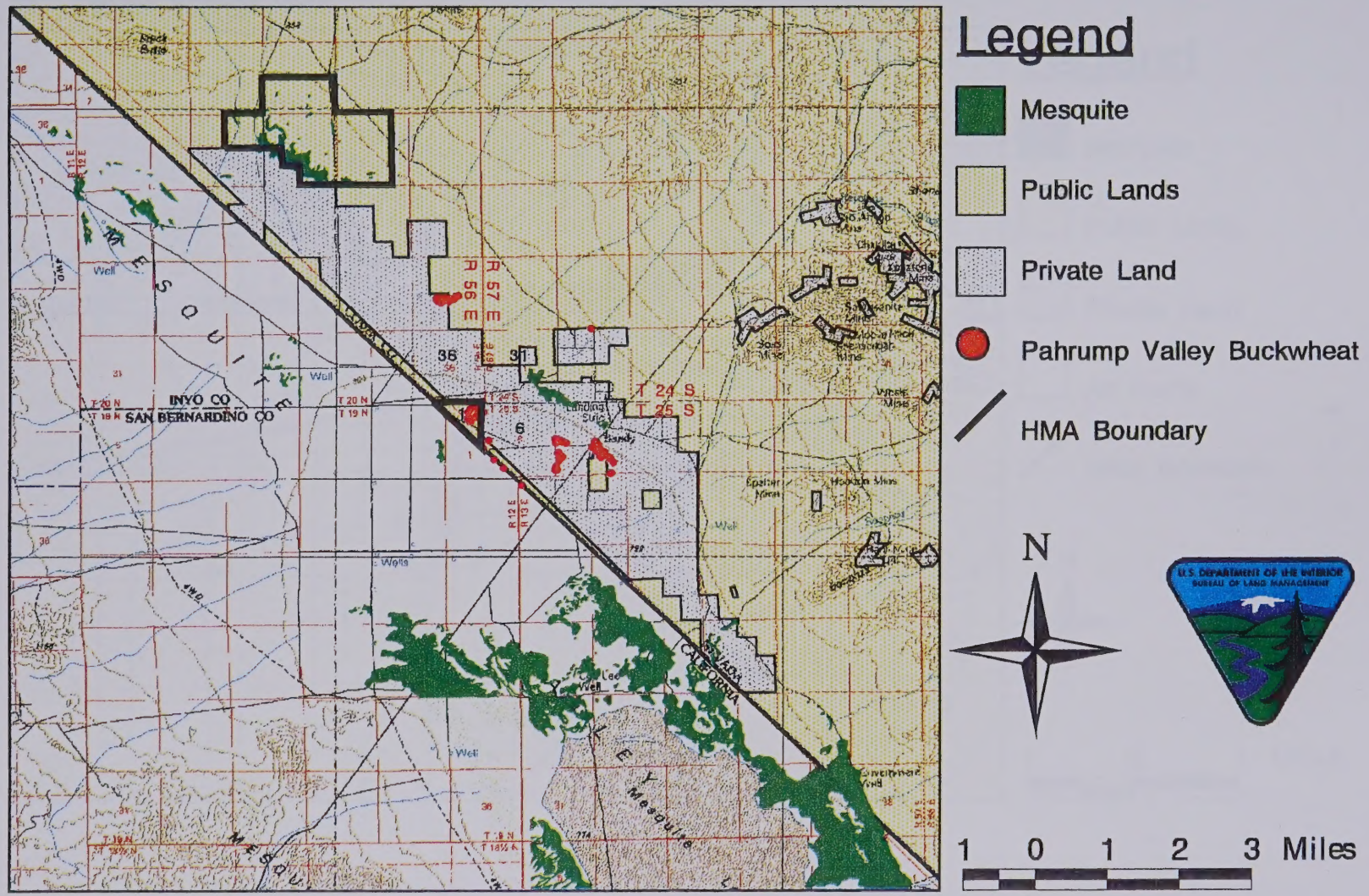
IE. Stump Spring HMA



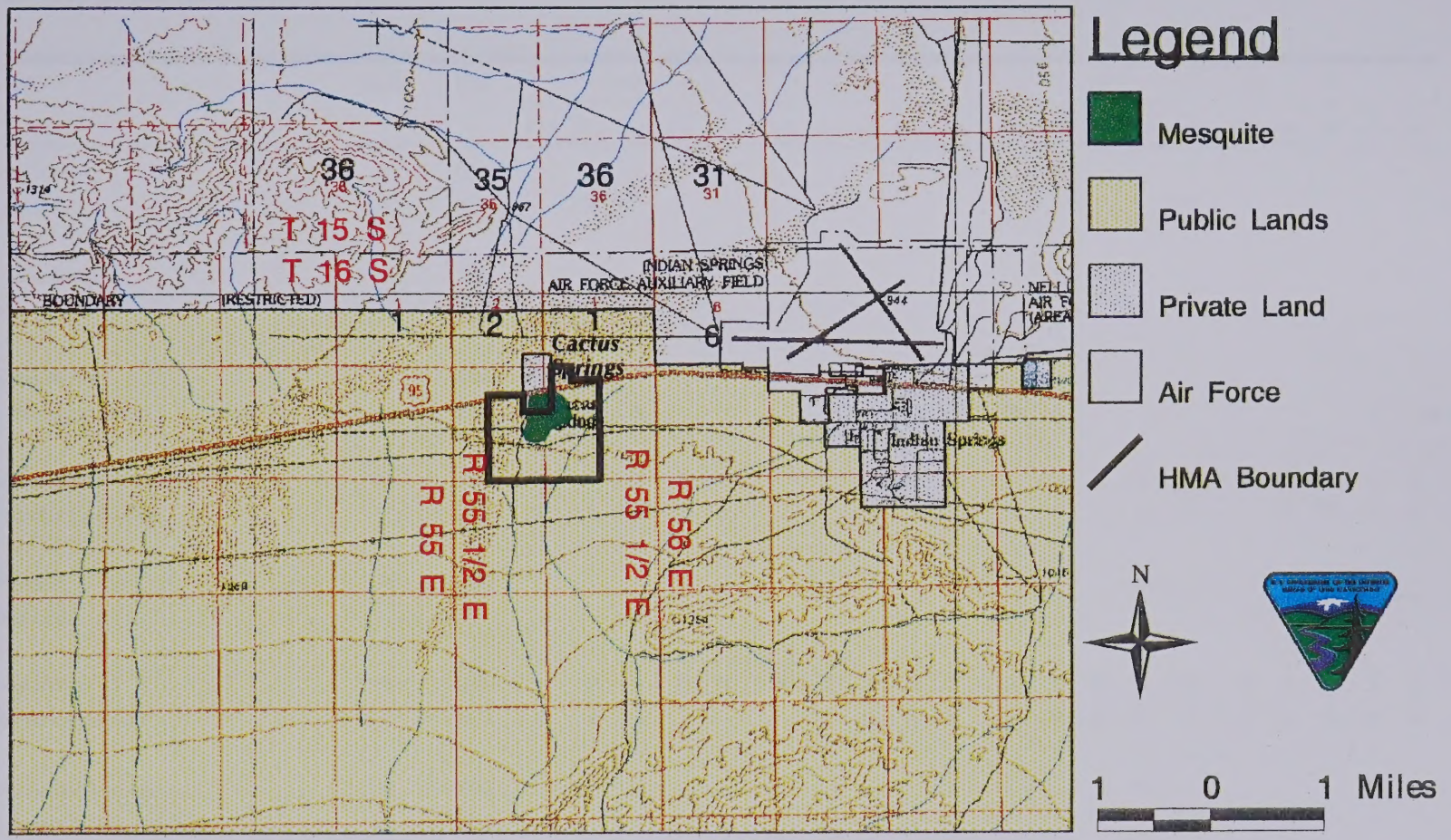
IF. Dry Lake HMA



IH. Sandy Valley HMA



IG. Cactus Springs HMA



Appendix II. List of avian species observed from February through June of 1996 and 1997 in four honey mesquite woodlands in southern Nevada.

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Abert's Towhee	B	1996																				
Pipilo aberti		1997		X	X	X	X															
American Kestrel	R	1996												X	X						X	
Falco sparverius		1997																				
American Robin	B	1996																				
Turdus migratorius		1997	X	X	X								X								X	
Ash-throated Flycatcher	B	1996			X	X	X				X	X			X	X	X			X	X	X
Myiarchus cinerascens		1997	X	X	X	X	X			X	X		X			X	X		X		X	X
Bell's Vireo	M	1996																				
Vireo bellii		1997																			X	
Bewick's Wren	B	1996		X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Thryomanes bewickii		1997	X	X					X	X	X	X		X	X	X	X	X	X	X	X	X
Black-headed Grosbeak	M	1996														X					X	
Pheucticus melanocephalus		1997																				

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Black-tailed Gnatcatcher	B	1996			X	X			X				X	X	X	X	X		X	X		
Polioptila melanura		1997	X	X	X	X	X			X		X	X	X	X	X	X	X		X		
Black-throated Gray Warbler	M	1996			X																X	
Dendroica nigrescens		1997			X											X					X	
Black-throated Sparrow	B	1996				X		X	X	X	X	X	X	X	X	X	X			X	X	X
Amphispiza bilineata		1997						X	X	X	X	X	X	X	X	X	X		X		X	X
Blue Grosbeak	M	1996																				
Guiraca caerulea		1997				X																
Blue-gray Gnatcatcher	B	1996				X	X			X	X	X				X	X				X	X
Polioptila caerulea		1997			X	X					X	X		X	X					X	X	X
Brewer's Sparrow	E	1996			X	X	X			X	X									X		
Spizella breweri		1997			X	X					X				X							
Brown-headed Cowbird	B	1996				X	X				X	X				X	X				X	X
Molothrus ater		1997				X				X	X	X			X	X	X			X	X	X
Bullock's Oriole	M	1996																				
Icterus galbula bullockii		1997			X	X					X										X	
Cactus Wren	B	1996		X	X	X																
Campylorhynchus brunneicapillus		1997		X																		

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Chipping Sparrow	M	1996																				
Spizella passerina		1997				X																
Common Nighthawk	B	1996									X											
Chordeiles minor		1997										X										
Common Raven	B	1996		X	X	X			X	X	X	X	X		X							
Corvus corax		1997	X				X	X	X	X	X	X			X	X		X				
Cooper's Hawk	R	1996													X							
Accipiter cooperi		1997																				
Crissal Thrasher	B	1996					X					X	X	X	X	X	X					
Toxostoma crissale		1997	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X	X	X
Dark-eyed Junco (Oregon subspecies)	W	1996	X																			
Junco hyemalis oreganus		1997	X		X				X													
Dark-eyed Junco (Gray-headed subspecies)	W	1996																				
Junco hyemalis caniceps		1997		X																		
Empidonax Flycatcher	M	1996				X	X				X										X	X
Empidonax spp.		1997			X	X	X				X		X		X							
Gambel's Quail	B	1996	X			X				X	X	X		X	X	X	X			X	X	X
Callipepla gambelii		1997		X	X	X	X			X	X	X	X	X	X	X	X				X	

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Golden Eagle	R	1996							X													
Aquila chrysaetos		1997																				
Gray Vireo	M	1996																				
Vireo vicinior		1997				X																
Great Horned Owl	B	1996											X									
Bubo virginianus		1997								X	X											
Greater Roadrunner	E	1996		X	X	X	X					X							X	X		X
Geococcyx californianus		1997	X								X			X		X					X	
Hermit Warbler	M	1996																			X	
Dendroica occidentalis		1997																				
House Finch	B	1996	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X
Carpodacus mexicanus		1997	X	X	X	X	X		X	X			X	X	X				X	X	X	X
Ladder-backed Woodpecker	B	1996			X	X																
Picoides scalaris		1997					X															
Lark Sparrow	B	1996									X	X										
Chondestes grammacus		1997				X					X	X										
Lesser Nighthawk	B	1996				X	X															
Chordeiles acutipennis		1997				X	X															

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Loggerhead Shrike	B	1996																				
Lanius ludovicianus		1997								X							X					
Long-eared Owl	B	1996																	X	X		
Asio otus		1997																				
Lucy's Warbler	B	1996			X	X	X			X		X				X				X	X	X
Vermivora luciae		1997		X	X	X	X		X	X	X								X	X	X	X
MacGillivray's Warbler	M	1996				X					X											
Oporornis tolmiei		1997				X																
Mourning Dove	B	1996			X	X	X			X	X	X			X	X	X			X	X	X
Zenaida macroura		1997	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X
Northern Flicker (Red-shafted race)	B	1996	X	X	X														X			
Colaptes auratus		1997	X			X	X															
Northern Mockingbird	B	1996	X	X	X	X	X		X		X	X							X	X	X	X
Mimus polyglottos		1997				X				X	X				X							X
Olive-sided Flycatcher	M	1996																				
Contopus borealis		1997																			X	
Orange-crowned Warbler	M	1996								X												
Vermivora celata		1997																				

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Phainopepla	B	1996	X	X	X	X	X				X	X							X		X	X
Phainopepla nitens		1997	X	X	X	X	X	X	X	X			X	X	X	X	X					
Red-tailed Hawk	R	1996																				
Buteo jamaicensis		1997			X										X							
Ruby-crowned Kinglet	W	1996			X									X	X				X	X		
Regulus calendula		1997		X						X								X				
Sage Sparrow	W	1996													X							X
Amphispiza belli		1997		X						X								X				
Sage Thrasher	W	1996	X	X	X			X			X							X	X			
Oreoscoptes montanus		1997																				
Say's Phoebe	E	1996									X											X
Sayornis saya		1997											X			X						
Sharp-shinned Hawk	B	1996																				
Accipiter striatus		1997			X		X								X					X		
Solitary Vireo	M	1996			X	X					X					X					X	
Vireo solitarius		1997																				
Spotted Towhee	M	1996											X									
Pipilo maculatus		1997																				

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
Townsend's Warbler	M	1996									X					X					X	
Dendroica townsendi		1997														X					X	
Turkey Vulture	R	1996		X		X	X		X													
Cathartes aura		1997			X					X		X										
Verdin	B	1996		X	X	X	X		X	X	X	X		X	X	X	X		X	X	X	X
Auriparus flaviceps		1997	X	X	X	X	X		X		X	X	X	X	X	X	X	X	X	X	X	X
Virginia's Warbler	M	1996				X																
Vermivora virginiae		1997																				
Warbling Vireo	M	1996				X										X					X	X
Vireo gilvus		1997				X																
Western Bluebird	W	1996	X					X														
Sialia mexicana		1997	X						X													
Western Kingbird	B	1996			X	X					X					X					X	X
Tyrannus verticalis		1997				X																
Western Tanager	M	1996				X	X				X					X					X	X
Piranga ludoviciana		1997																				
Western Wood-pewee	B	1996									X											X
Contopus sordidulus		1997					X									X					X	

Species	Code[a]	Year	MO[b]					PA[c]					SS[d]					SV[e]				
			Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun	Feb	Mar	Apr	May	Jun
White-crowned Sparrow	W	1996	X	X	X	X			X	X			X	X				X	X	X		
Zonotrichia leucophrys		1997	X	X	X			X	X				X	X	X						X	
Wilson's Warbler	M	1996				X				X	X					X					X	X
Wilsonia pusilla		1997				X										X					X	
Yellow Warbler	M	1996																				
Dendroica petechia		1997				X					X										X	
Yellow-breasted Chat	B	1996				X	X				X					X						X
Icteria virens		1997									X											
Yellow-rumped Warbler (Audubon's race)	M	1996																		X		
Dendroica coronata		1997				X													X		X	

[a] B = Breeding; E = Edge; M = Migrating; R = Raptor; W = Wintering.
[b] Moapa.
[c] Pahrump.
[d] Stump Spring.
[e] Stewart Valley.

Appendix III.

Reptile species known to occur within and adjoining to
Mesquite Woodland Habitat Management Areas
in Southern Nevada*

Lizards

Banded Gecko	*Coleonyx variegatus*
Chuckwalla	*Sauromalus obesus*
Collared Lizard	*Crotaphytus insularis*
Desert Iguana	*Dipsosaurus dorsalis*
Horned Lizard	*Phrynosoma platyrhinos*
Leopard Lizard	*Gambelia wislezenii*
Night Lizard	*Xantusia vigilis*
Side-blotched Lizard	*Uta stansburiana*
Spiny Lizard	*Sceloporus magister*
Whiptail Lizard	*Cnemidophorus tigris*
Zebra-tailed Lizard	*Callisaurus draconoides*

Snakes

California King Snake	*Lampropeltis getulus*
Coachwhip (Red Racer)	*Masticophis flagellum*
Glossy Snake	*Arizona elegans*
Gopher Snake	*Pituophis melanoleucus*
Leaf-nosed Snake	*Phyllorhynchus decurtatus*
Long-nosed Snake	*Rhinocheilus lecontei*
Mojave Rattlesnake	*Crotalus scutulatus*
Night Snake	*Hypsiglena torquata*
Panamint Rattlesnake	*Crotalus mitchellii*
Shovel-nosed snake	*Chionactus occipitalis*
Sidewinder	*Crotalus cerastes*

* The above information was obtained from records of commercial reptile collectors held at the Nevada Division of Wildlife. The Nevada Division of Wildlife cannot guarantee the accuracy of the above data.

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